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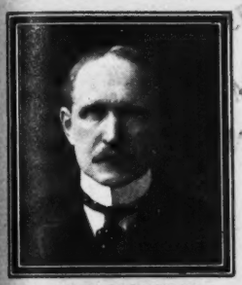

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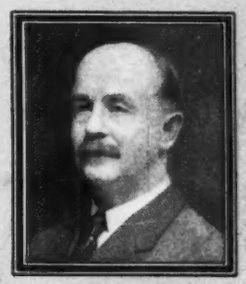

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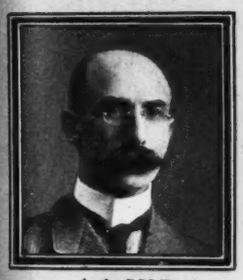

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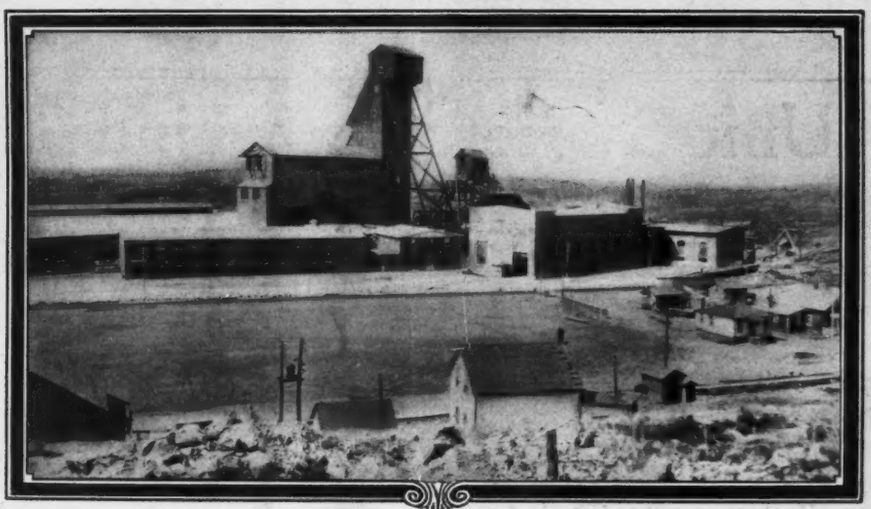

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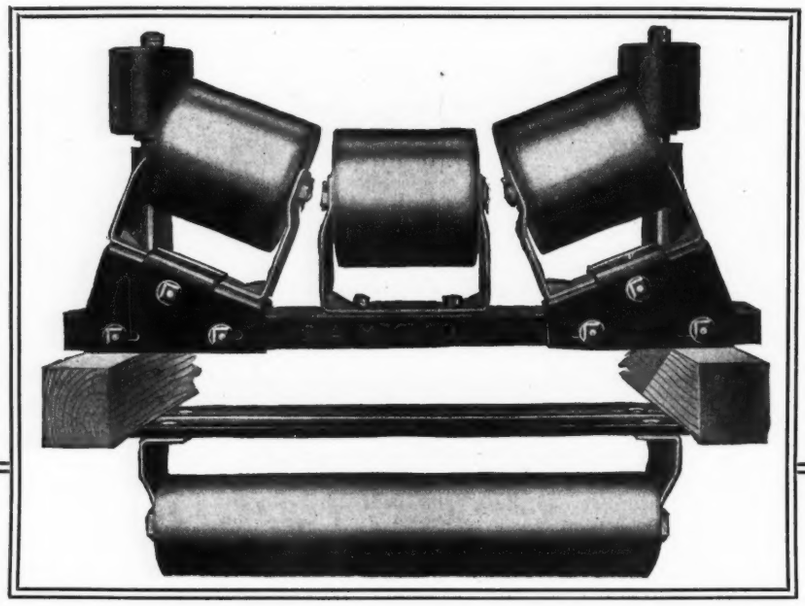

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Engineering and Mining Journal

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Volume 109 New York, March 13, 1920 *Number* 11

Canada's Undeveloped Mineral Empire

THE ore deposits, mines, and prospects of the United States have been combed over many times during the last few years by development companies, private investors, and promoters, and it has been demonstrated that mining propositions are exceedingly scarce; and even the material for a healthy wildcat is difficult to find. Barring the occasional new strike, which will still occur from time to time, the zenith of the mineral boom of the United States has been reached.

It is not so, to the same degree, with the rest of North America. The plateau region of Mexico has been well searched through many times, it is true, and the populous southeastern part of Canada; but the mountainous Sierra Madre belt of western Mexico still has undeveloped mines; Central America has undeveloped districts; and above all, perhaps, Canada has a vast territory which has been and is inaccessible on account of lack of transportation. Between the populated belt of the southern part of the provinces of Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia, and the Arctic, in the vast regions of Ungava, Keewatin, and Mackenzie, is an Empire of the North uninhabited except by a few natives, and uncharted except by the swift trips and pencil sketches of explorers.

By all the laws of probabilities, important mineral deposits remain to be uncovered in this region, and the vastness of it promises an aggregate of great ultimate importance. Promising ore deposits lie on the southern frontier, as in The Pas district of northern Manitoba. British Columbia mines, as at Surf Inlet, Premier, and Dolly Varden, are opening up, while the old mines of the United States are closing down. Iron ores are known on Hudson Bay; and, far north, the Coppermine River county east of the lower Mackenzie and Great Bear Lake is a region of copper-bearing amygdaloids—a great low-grade copper district resembling that of Lake Superior in many ways, which has been only slightly prospected, but which probably some day, with proper transportation facilities, will be worked. As the metallic treasures of temperate zones begin to wane, those of the Tropics and the Arctic will be swiftly seized upon.

Transportation will be the great problem for exploitation; and it has been the great obstacle to prospecting. The development of Canadian railroads has been wonderful in its pioneering: they have been pushed forward, as were the first transcontinental lines in the United States, in advance of the population of the districts they are designed to serve; they have hesitated at no obstacles, and, the conservatives in Canada would say, have stopped at no line of common-sense caution. It is a brave sort of folly, so far as it is folly; and, in the long run, the policy will be justified. But even so, the lines of transportation touch only the periphery of the Arctic Empire. This is accessible only by canoe, by river, lake, and portage, in summer, and by swift dog trips, by the most hardy only, in winter. A trip from the southern populated provinces to the northern part of this region, as to the Coppermine River country, for example, and back, requires about two years. In winter, no tarrying is possible; in summer, mosquitoes render exploring difficult. Only in the late summer and autumn is the climate ideal, and then only are the days golden. But there are no prospectors to enjoy these conditions. A solution to this question appears to us, and appears so important that we are going to mention it in a second editorial.

The Airplane for Canadian Prospecting

IN THE FOREGOING editorial we have pointed out the great mineral possibilities of arctic Canada, and the need of prospecting. Exploration and prospecting must precede any plans for opening up development and exploitation, or the providing of means of easy transportation. The canoe in summer and the dog sled in winter are nearly useless as solutions to this problem. Travel by paddle, pack, and portage is tedious. What about the air?

In our issue of Feb. 14 we published a short article on "Airplanes in Mining Operations." We regarded this at first as a novelty article rather than one of broad application, but since studying the subject further we have arranged for a larger article, which we shall soon bring forth. The evident and immediate practicability of this help to prospecting and development seems to us beyond question; and we predict that the airplane will prove of great utility in bringing to knowledge mineral deposits of the waste places of the earth, and that soon.

The main problem for an airplane is landing places; and arctic Canada offers ideal conditions for this in her thousands of lakes, hollows gouged out by the great continental glacier of long ago, and now covering a good part of the surface. It is on account of this that canoe travel is possible through the north. An airplane of the hydroplane variety could find a landing place in a small lake or quiet bay of a large lake almost everywhere in the region under discussion; and could ride safely till ready to start. Any minor accident which would require temporary landing would not be serious.

An airplane, which could be hired for the purpose, with skilled aviator and pilot, for a relatively small amount, could transport in one trip say three men and supplies for a season to a given point. The trip could be made early in August, so that the explorers could investigate through the late summer and fall; and the airplane could at an appointed time call for them and bring them back to civilization before the severe cold set in. If the airplane should circle around in a radius of fifty miles from the camp, and a few photos be taken, a rough map could be obtained from which the prospectors could plan their excursions.

We need not dwell on the details of such a plan—the further possibilities, or the sane precautions which will occur to any old woodsman or son of the North. We would not recommend such a trip to greenhorns; but for the experienced traveler of sporting blood, surely this would and will appeal. The cost would be beyond the reach of the average prospector; but with one partner who had a little more than the minimum amount of cash to blow in, or the backer always ready to finance a romantic chance, the funds would not be hard to find. The charm of exploring, charting, treasure-hunting, and fishing, in a new country, would be combined and the trip could be robbed of the usual tedium and hardship.

Airplanes in New Ontario

ALREADY, indeed, the use of the airplane in mining districts where rail transportation is unobtainable or poor is slowly spreading. Canadian reports state that the McCarthy Aero Service, Ltd., has been organized, with New Liskeard, a town in the Cobalt district, as a base. The proposed service will extend south to North Bay and Sudbury, west to Elk Lake, Gowganda, and the Montreal River mining sections, and north to Porcupine, Cochrane, and as far as James Bay. Many of the smaller mines in this area are off the railroad, and even those situated on the lines of T. & N. O. do not speak any too kindly of the service rendered.

The opportunity for an efficient air service without doubt exists, but this is rough country, and a pilot, unless he stuck close to the numerous bodies of water, might have many hair-raising landings to make. The report that we read states that on the first trip several colonies of bees will be transported. However, should anything really serious happen their help would appear to be insignificant.

The Canadian Metal Industry—A Brief Review

ONLY comparatively recently has Canada begun to develop her vast mineral resources. Her nickel deposits, discovered about 1885, produced less than 5,000 tons a year until 1902; production from the Cobalt silver district dates from about 1905; and opening of the Porcupine gold district followed about seven years later. British Columbia, the principal other mining province, has been undergoing development for a somewhat longer time, but not until 1900 did the value of its metal production pass the $10,000,000 mark. We can, therefore, say that most of the progress in the Canadian mineral industry has occurred within the last score of years. The extent of this development is remarkable.

The most important of the various products is nickel, and it is likely that this country produces about 80 per cent of the world's supply. Excepting coal and iron, silver is the next metal of importance, the Canadian output in 1918 being about one-third that of the United States. The gold production is about one-quarter of the United States figure, and increasing rapidly.

Canada can now boast of several metallurgical works of importance. Three smelters within a few miles of each other are treating the nickel-copper ores; one of these, that of the International Nickel Co. at Copper Cliff, is the sixth largest smelter on the continent; all are modern plants. The new nickel refineries at Port Colborne and Deschene are models of their kind.

The Cobalt silver camp, which has made a record of over 31,000,000 oz. of silver in a year, has passed its heyday, but is still an important producer and possesses some well-equipped mills. One of the most important is the Nipissing, which is now turning out silver at the rate of over $500 an hour. The three big mills at Porcupine are owned by the Hollinger, the Dome, and the McIntyre companies, with capacities of 3,500, 1,500, and 550 tons, respectively. The Porcupine deposits are destined for a long life, and the camp, already one of the greatest gold producers in the world, is improving every year. The gold deposits in the Kirkland Lake district are also rapidly assuming importance.

In British Columbia, the chief producer of copper, lead, and zinc, one of the largest and most up-to-date mills is that of the Canada Copper Corporation, at Allenby, which will probably be put into operation this year. This province also boasts of one of the most interesting mills and smelters on the continent in the plant of the Consolidated Mining & Smelting Co. at Trail. Many new processes have been developed here, especially those involving the electrolytic treatment of complex zinc ores. In variety of work done, the activities of this company can probably not be equaled. There is a copper-smelting plant, a lead-smelting plant, a copper and lead refinery, the latter being an electrolytic Betts' process plant; a sulphuric, and a hydrofluosilicic acid works; and a zinc concentrator, with an electrolytic zinc department, not to mention the bluestone and briquetting plants. At Anyox, the Granby company possesses the fifth largest copper smelter on the continent, and is doing some of the most successful work in pyritic smelting which has been accomplished anywhere. The Grand Forks smelter has been closed. Interesting features there were the manner of running the charge cars directly into the blast furnaces, and the use of multiple settlers; making money by the direct smelting of ores running less than 1.5 per cent copper also proved interesting.

Canada's record in the mining and metallurgical industry is one to which she can point with pride, for it is largely through the efforts of her own men that progress has been made. Her technical schools, such as McGill, Toronto, and Queens, about which we hear little on this side of the line, have produced some brilliant men. To be sure, American capital has been employed in many cases, but any new country requires outside financing in part.

Canada is to be congratulated on a stable government which investors do not fear. Some political agitators of the type of J. H. Dewart have threatened to make trouble, but the country's standing has happily not been injured.

The Steel Corporation Continues

IT SHOULD be a source of great satisfaction to the American public that the Supreme Court has decided that the business of the United States Steel Corporation has been and is being conducted in strict conformity with law. The judgment in this case will undoubtedly meet with hearty approbation, at any rate from those who have taken the pains to ascertain the facts concerning the controversy. It was admitted that the control and resources of the corporation were such that it was in a position to dominate the steel industry, but there was no evidence to indicate that it had tried to do so. Furthermore, it was maintained that "to order the dissolution of the corporation would involve the risk

of great disturbance in the financial, commercial, and economic structure, and thus would menace the public interest," which in this case the court held to be of paramount importance.

It is refreshing in the present day, when dissention and strife are apparent in many quarters, and dissatisfaction is quite freely expressed with respect to the management of our domestic and foreign affairs, to hear that some attention is being paid to the possible effect of radical changes. We read that the "public interest" is held to be of "paramount importance," and such judgment, handed down from the highest court of the land, establishes an example that may well be followed in future cases wherein similar principles are involved. That the public interest was well served by the United States Steel Corporation, and that this condition continues, is apparent from the decided stand taken by the corporation in regard to the fixed prices of steel products, which have remained constant since March 21 of last year. This action alone, in the face of opposition, has been the means of preventing profiteering.

Today, as for some time past, the Steel Corporation occupies the position of a national institution. Each step in its growth has recorded notable accomplishment, and the policies pursued have been typical of a well-managed business. Without its stabilizing influence, the steel industry would undoubtedly have fallen into the demoralized state, following the Great War, that has been the lot of other businesses.

In particular, mining and metallurgy have been enriched to an extensive degree by the work done in these fields by the corporation. Methods adopted by its many subsidiaries are in use throughout the world, and although disclaiming the originality of many of the systems, they have improved them to such an extent that Steel Corporation methods are now accepted as standard. This is true, in a greater measure, of the metallurgy of steel. What is true of metallurgical technique is more so when mechanical appliances improved during the past two decades are considered.

A Suggestion To Expedite the Work Of the War-Minerals Relief

UP TO FEB. 21, sixty-five awards had been made to claimants by the War-Minerals Relief Commission, amounting to $715,324, leaving 676 to be handled. These must needs wait, many of them at least, for a long time. In this condition, Secretary Lane, primarily entrusted with and responsible for the adjustment of these claims, leaves them to his successor; for he terminated his official connection on the last day of February, to take up a more lucrative position in private life.

Many of these claimants will grow weary and bitter over the delay, which affects alike the just, the near-just, and the unjust, without discrimination. One engineer who had a claim which sounded worthy advised us that he had written over a hundred letters to the commission in the endeavor to get a hearing, which he had not yet obtained. He had lost his all in the chrome-mining venture under which he made the claim.

We would offer a suggestion to Secretary Lane, if he were still with us. As it is, we offer it to his successor. It is a plan that might hasten the swiftness of justice in many cases, and permit, to a far less degree, the wheels of justice to be blocked by the delays of a few swaggering and contentious claimants and their lawyers.

Let the examiners, who stand between the engineers and auditors of the Bureau of Mines and the commissioners, and the commissioners themselves, make it a point to keep up with their decisions and awards with the cases as fast as reported on by engineers and auditors; and let the work of the latter be speeded up if necessary, which is perfectly feasible, and almost to any extent. Let it be understood that any and all decisions are open to appeal by the claimant, to the commission, and to hearings and re-hearings before the commission: but let an iron-clad ruling be made that it will not be the policy of the Secretary to have the commission hear such appeals till all the cases have been passed on, in a preliminary way. Thus, each case would be reached and passed on at the earliest moment, and Ole Oleson, in Oregon, who mortgaged his farm to increase the chrome production, would get his money and be satisfied; as well as old Jim Jackson, in California, who had his first carload on the way to the railroad when the armistice was signed. Even the small portion of those patriots (among the predominance of true patriots) who put the accent on the *pay* would be awarded something to which they had no moral right, and make off with the consciousness of a sharp trick deftly turned. Probably three-quarters of those to whom awards were made would accept the awards, favorable or unfavorable, and go their ways. When the last award had been made, the arena should be thrown open for appeals: and to prevent again the long-winded claimants and their attorneys from blocking the line, each case would be given a maximum of one day. Should they require more, they would have to go to the end of the line and wait their turn for another day. Cases should be taken up numerically without favor; and no premium should be allowed on the ability to elbow to the front and stay there.

It is understood that the Committee on Mines and Mining of the House, moved by the necessities for future expression on the part of eloquent individuals, like the lawyers for the Chestatee Pyrites Co. (case No. 1, to which we referred in a previous editorial), will ask Congress to pass legislation which will give the right of appeal from the Secretary to the Court of Claims. Originally the decision was given to the Secretary without the right of appeal. Had Congress wished to pass the cases to the Court of Claims, it could have done so in the beginning; but it wished matters settled in each case once and for all by common-sense methods, not dragged out with the mockery of the "law's delay," with which we are too familiar; and the only reason why it will reverse itself now, if it does, will be because certain claimants cannot get what they want from the Secretary, and lawyers on contingent fees are willing to fight it out indefinitely. We confess that the lawyers are not properly provided for by the present procedure.

The attorney for the Chestatee company, according to our Washington correspondent's report on Feb. 21, said: "Then after we passed this relief measure, thinking that we could come to Washington and sit around a table with business men and adjust these differences upon business principles," etc. The phrase is not accidental—the Chestatee claimants, we believe, take most of the credit for the passage of the War-Minerals Relief bill, and cannot understand why, if that be so, they should be denied, in their position as claim No. 1, what they ask. They believe and they still hope they have weight enough to get it in the end.

WHAT OTHERS THINK

The Gold Taxation Question

Shall the arts be taxed for gold used in dentistry and jewelry and paid to the mine owners who now make a loss producing gold at $20.67 per oz?

There is much conjecture among the gold users and producers as to the outcome of the gold situation. Harold M. Lawrie, economist for the American Mining Congress, claims the purchasing power of one ounce of gold at $20.67 is only $9. The Mining Congress held in St. Louis in November last passed a resolution expressing the opinion that the gold standard should be maintained, but requesting the Government to place a tax of 50c per dwt., or $10 per oz. on all gold used in the arts.

The total amount of gold used in the arts in 1918 was $52,409,740, but of this amount $32,892,395 was new gold and $19,517,345 old gold. In other words, the arts purchased $32,892,395 new gold and furnished themselves old gold derived from waste, sweepings, discarded jewelry, and old dental crowns and bridges valued at $19,517,345. Of the $32,892,395 new gold used in the arts, $12,000,000 went into dentistry and $22,000,000 into jewelry and similar manufactures.

The suggested tax of $10 per oz. would cost the dentists in America annually $6,000,000, the jewelers in America annually $11,000,000, and there would be available for the mine owners about $17,000,000.

The only humane purpose for which gold is used today is for the manufactures incident to dentistry. The gold used in the jewelry trade is a retention of the savage instinct for personal adornment.

The argument advanced for levying this tax on the arts gold is that only in the arts is gold lost from circulation, and that gold used in trade balances between different persons and governments is merely a transfer from one person and country to another without any gold being lost or consumed.

How much gold used in the arts is actually lost? It is a question if there is not more gold lost in transportation from wrecks and erosion in shipping gold than is lost in the dental and jewelry trade.

Let us look at the losses of gold in the arts. The United States Mint reports a loss in the operative department for the year ending June 13, 1919, of $13,764. This was from the melting and coining of millions of dollars worth of gold. But the full $13,764 would be recovered by the refiner, so as far as the gold in this first operation is concerned, maybe a few grains only would be actually lost.

From the mint $12,000,000 in gold bullion goes to the dental gold manufacturers to be worked up into dental gold. The experience of the dental manufacturers is that there is no actual loss of gold in its fabrication, but there is a loss in labor in recovering gold in the operations from crucibles, sweepings, and such incidentals, and in a year's operation an insignificant amount of gold only is actually lost.

In the jewelry trade the same thing happens with gold as in dentistry. Little gold is actually lost from the time the bars are purchased from the mint until the jewelry and ornaments are separated from the dead. The amount that goes to the grave with the dead is small. And who knows but the rings and ornaments with which Anthony bedecked his Cleopatra have done service as money and jewelry through all the generations?

There is no argument for the tax on gold used in the arts because of the quantity lost in the arts. There is no doubt much more gold actually lost from the world's supply by erosion and wrecks in transporting trade balances than in the arts, including that which is buried with the dead.

The main trouble in the gold-mining situation is that the cost of labor and materials has been increasing year by year, so that taking the gold mines as an average they cannot produce gold for $20.67 per oz. If it were not for the discovery and introduction of new methods in the recovery of gold, such as cyanidation and flotation, the gold crisis would have been brought to the world's attention twenty years ago. New and sudden advances have been made in labor and materials in the last four years, so that the cheaper methods of recovery from cyanidation and other improved processes no longer compensate for the advanced costs.

If wheat, oats, automobiles, stoves, or shoes cannot be produced at pre-war prices, how can we expect to produce gold at pre-war prices? The world wants more gold, and the Mining Congress would stimulate production by taxing the gold used in the arts to pay the loss in producing it. Wouldn't it be about as wise to place a tax on macaroni, to be paid to the farmer for his loss in raising wheat?

I doubt whether the suggested standard price of gold of $30 per oz. will stimulate production to equal the yearly output for the past ten years, which averaged about four hundred million a year.

If the total production of gold in the world since creation is twenty billions, and of silver eighteen billions, and all countries are either on a gold or silver standard, this twenty billions of gold and eighteen billions of silver should have a value equal to all the debts of all nations on a gold or silver basis plus all gold bonds issued by different corporations in the world. Therefore, gold must have at the present time an intrinsic value of at least $150 per ounce, if it is to stretch itself enough to cover these world obligations.

If the chains that now bind gold to $20.67 per oz. were broken, there are enough obligations demanding payment in gold to cause its price to soar to $100 per oz. in twenty-four hours, and the miners would be stampeding to stake claims on the ocean to reclaim the grain of gold supposed to be contained in one ton of sea water.

A. D. WILLIAMS.

Buffalo, N. Y., Feb. 20, 1920.

World's Record for Shaft Sinking

I wish to call your attention to the statement made in the Feb. 14 issue of *Engineering and Mining Journal*, on page 453, regarding the previous world's record for shaft sinking. Therein, you state that this record was held at the Crown Mines, where 252 ft. was made in a thirty-one day month. The statement is incorrect, as this record was held by my firm, having established in August, 1916, a record of 261 ft. of sinking in

thirty-one days. This work was performed for the Chief Consolidated Mining Co. in Tintic district, Utah, at its Homansville shaft. The measurements were checked and certified by an independent firm of surveyors, namely, Brown & Brooks, of Salt Lake City.

An article concerning this work and explaining the methods used appeared in one of the issues of *Engineering and Mining Journal* of that year.

Eureka, Utah, Feb. 23, 1920. WALTER FITCH, JR.

[The article to which Mr. Fitch refers was "Rapid Shaft-Sinking With Suspended Bulkhead," by Walter Fitch, Jr., *Engineering and Mining Journal*, Nov. 18, 1916, page 903. We are glad to publish this letter and correct our statement of Feb. 14, page 453.—EDITOR]

The Economist and the Gold-Mining Problem

In your issue of Jan. 31 you quote from my article in *The Annalist* of Dec. 15. On page 300, however, you draw attention to what appears to you to be a defect in my advocacy of a dollar-wheat circulation for Russia. I think I may claim to be the last person in the world to have overlooked the point to which you draw attention. In the last paragraph but three of the article you quote you will find it stated that "It cannot be too often repeated, nor too well understood, that prices are not raised by the issue of any amount of currency so long as that currency represents *only wealth ready for exchange*. Issues of currency that inflate prices are issues in excess of values awaiting exchange." Again, if you will refer to my article in *The Annalist* of Aug. 4, 1919, you will find it stated that "The methods by which currency is increased fraudulently are the issue of counterfeit coin, the issue of counterfeit notes, the issue of accommodation bills of exchange, and the issue of corporation stock in excess of convertible assets, otherwise known as watered stock. All these methods have the same effect on commerce."

The function of a bank is there stated to be primarily the prevention of the issue of currency on these false securities. If a bank inadvertently fails to effect this end, it is a result of misrepresentation. No competent banker would for a moment encourage such issues. The true function of the Stock Exchange is to mark down securities to their real value, and so to assist the banks. There is no more expert valuer of securities than the Stock Exchange. Incidentally, it is worth while noting that the Stock Exchange has at the present moment appraised the railways at between twelve and thirteen billions, a more accurate valuation than could be obtained by any other means. The acceptance of that valuation would meet all the difficulties that have been raised around the Cummins bill.

If there be any further doubt as to my views in the matter of currency they can be found fully set out in *The Annalist* of June 9 last. Not the least important contention is that, whatever may be used as a standard of value, it must always be a commodity that is in greater demand than supply. I cannot ask to trespass further on your space, which would be necessary for a full exposition of the point; I can only refer your readers to the articles named, from which it will be abundantly clear that I have by no means overlooked the point to which you have drawn attention.

Berkeley, Cal., Feb. 21, 1920. R. ESTCOURT.

Money

Among other dicta pointed out in recent editorials and in your correspondence columns, in the course of the discussion of the money question and gold and silver, the following appear essentially fundamental: First, the credit of the nation, in the last analysis, is based upon the taxable wealth of the nation; second, the market value of silver has risen with the increased demand for the metal, and third, the "price" of gold remains stationary because it has been "pegged."

From time immemorial some "token" has been used; for centuries gold and silver have been tokens of exchange in trade and commerce. As to value, gold and silver have (up to the time of "pegging" gold, or fixing a price on silver) passed on the basis of their relative scarcity compared with that for which they stood, for which they were "token," in trade.

Today, silver, relative to its exchange value in trade and commerce, is seen in a position little dreamed of before the beginning of the war; gold, likewise, is in a position unthought of at the time of "pegging" it at $20.67 per oz. Silver has been released from the artificial bondage; why not release gold? Release gold and permit it to seek its natural level according to the inexorable law of supply and demand—a law, by the way, which we cannot beat by any artificial device—and, with the two *accepted* metals of *sentimental value*, as the index of the nation's wealth, in coin or bullion, issue currency of legal tender in all transactions. To meet the requirements of the popular demand for coin, and for convenience in small transactions, the metals can be minted under the average melting value of the times, for necessary circulation.

When gold was "pegged" the "value" was adapted from the current, relative exchange worth of the metal in trade and commerce. That "relative value" has changed greatly in the years since. Gold coins have been passed and accepted, even before the war, for more, in trade and commerce, than they were worth.

Today the disparity has become so great that they are no longer acceptable on the same basis; furthermore, the "cost" of producing an ounce of gold has increased so greatly that the ounce produced will not pay for the mining, milling, and refining; hence the effort to produce has been largely abandoned, and production has fallen off; there is less per capita than ever before. Still, we cling to the pegged "price." Why? Because someone says it would bring about a "crisis," a panic, a what-not! Who says this? The same who have said a good many other things about finance, its causes and its effects—during the past five years—only to be utterly discredited. Who can fortell the effect? Who could have predicted, at the time of "pegging" gold, what the future effect would be as discerned today?

Bimetallism is the heritage of a gradual, financial development of hundreds of years' progress toward civilization; bimetallism *in the open*, not bimetallism on a fixed ratio, nor bimetallism on a "pegged" standard.

Are we of the United States far enough advanced to risk a currency backed by the bars of these metals, bought by the Government in the open market at their relative values as prescribed by Nature's law of supply and demand? Can not we, like England, with her premium on gold, risk the release of gold with no more effect on the affairs of the nation than has been disclosed with England? L. S. ROPES.

Berkeley, Cal., Feb. 21, 1920.

By The Way

Maple Leaves

Authority to regulate the construction of mine locomotives is to be given the Department of Mines of the State of Pennsylvania, as the result of action by state mine officials, operators, manufacturers and engineers, at a recent conference in Harrisburg. Now, if they will only take a few leaves out of Ontario's book and put a locomotive engineer in charge of the department all will be hunkydory.

H. B. C.'s 250th Anniversary

The celebration of the 250th anniversary of the famous Hudson's Bay Co. will take place at Victoria, B. C., on May 2, 1920. Interest will center about two buildings in the heart of Victoria, which throw into unique contrast the company's past and present. A little one-story structure, the first H. B. C. store built on Vancouver Island, is still standing in the city's heart. It is built of English brick brought around the Horn in early days, and stood just outside the company's fort, built by James Douglas in 1843, but removed after 1867. The other building is the imposing ornamental four-story structure now nearing completion and one of the finest of the dozen modern department stores now maintained by the whilom fur traders. The little brick store became the chief outfitting point for miners and prospectors who came from all over the world to take part in the stampedes to the gold fields of the Cariboo in 1856-65, the Omineca in 1869-70, the Cassiar in 1870-72, and the Klondike in 1896-1900. The old building, which dates back to the city's first days, is still used as a warehouse.

International Ethics

Candidates for admission to the International Metallurgical and Chemical Society, of Billings, Mont., pledge that they will conduct themselves upon the highest ethical and professional basis and otherwise carry themselves in a manner which will do honor to themselves and the society. All applications must be accompanied by the admission fee. The secretary of the society is Roy Franklin Heath, who thus far is the only one who has succeeded in isolating that very elusive element wilsonium.

Exploring the Northwest

David Thompson's narrative of his explorations for the Hudson's Bay and the North West companies, which was edited for the Publications of the Champlain Society by J. B. Tyrrell, of Toronto, is full of interesting adventure from cover to cover. In the course of his travels, extending over many years, Thompson made a survey of the Great North country from sea to sea. About 1798 his westward course took him through what is now the Keweenaw Peninsula on Lake Superior, of which he wrote: "The River Ontonoggan (the native name) has from old times been noted for the pieces of pure copper found, of which the Indians made their weapons before the arrival of the French, and afterward for the service of the churches.

"Learning from my men that a short distance up the river there was a large mass of copper, we left our canoe and proceeded on foot to it. We found it lying on a beach of limestone at the foot of a high crag of the same, its shape round, the upper part a low convex all worn quite smooth by the attrition of water and ice, but now lying dry. We tried to cut a chip from it, but it was too tough for our small axe. At the extremity of the great point called by the natives Keewewoonanoo (meaning "We return") now shortened to Keenwenaw, in a small harbor we took pieces of copper ore. I named it Copperass harbor."

One Twenty-Five Each

Shareholders of the American Tin & Tungsten Co. may exchange their holdings on the basis of five shares of stock and $1.25 in cash for a share of National Tin Corporation stock, subject to delivery on or before March 31, 1921. The offer of exchange expires on March 30, 1920, and no extension will be granted.

From Songster to Sulphide

The Vinegar Hill Zinc Co., of Platteville, Wis., has "started a new shaft south of Leadmine and immediately east of the old Drum, formerly known as the Nightingale; the property has been rechristened the Galenite," to quote from our correspondent's letter. From Nightingale to Galenite is a most clever change. It also suggests a leaning toward simplified spelling.

A Future Senator

Samuel D. Nicholson, of Leadville, Col., is a candidate for nomination as U. S. Senator from his state. In a recent announcement made "to the men and women of Colorado," Mr. Nicholson said: "Residing in this state since boyhood, I am indebted to Colorado and her people for whatever success I may have enjoyed, and appreciating that fact, and believing I know the needs of both, my life work will be devoted to their interests. Having no college degree, the only diploma which I possess is that of moderate success, awarded me by the University of Experience after many years of honest toil and honorable business enterprise which had its beginning with a miner's pick. My life among you for forty years has been an open book, and upon it and upon the principles here stated, I stand as a candidate, with the assurance that the party nominee, whoever he may be, will receive my cordial and hearty support on election day."

A Certificate of Assay

R. H. Officer & Co., assayers and chemists of Salt Lake City, are pulling at the prospector's heartstrings by way of opening their spring compaign for new business. A "certificate of assay" received from them reads as follows:

"Th' green's comin' into the trees" out here, as Riley says. The Western air has the softness that presages the melting snows in the hills, the drying mud on the trails and roads, and the tang of the sagebush, the pine and the desert dust. All this lures you and calls you to the corduroys and high boots.

Soon you will be scouring the West in your quest for ore, and when you have found your El Dorado we would have you know that we are ready to determine for you the intrinsic worth of your find—just as we have done for these twenty-eight years past.

We will welcome you to our delightful city and to our business home—and we hope you will feel free at all times to call upon us for any service within our capacity, with the assurance that we will give our best efforts to assisting you in every way.

This makes us feel inclined to pick up the first chunk of quartz that we find and send it to them for assay without waiting for spring.

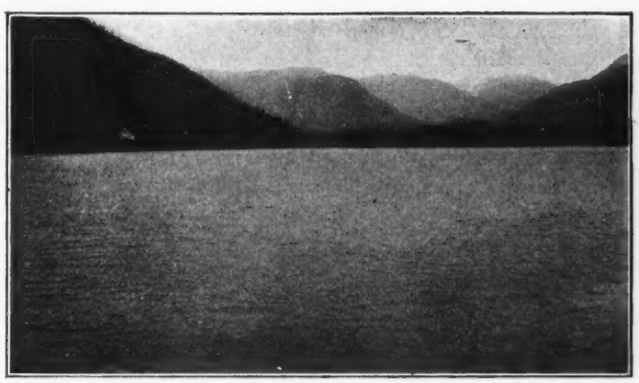
The Dolly Varden Mine

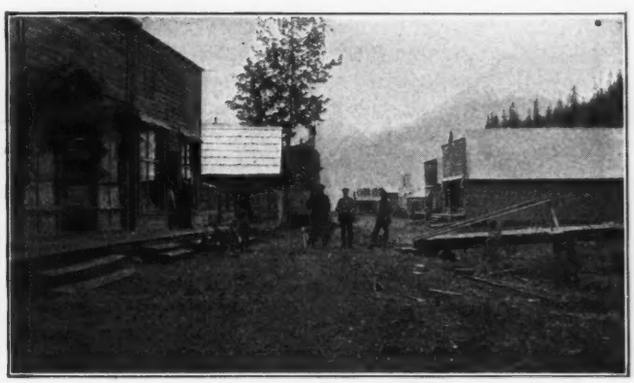
Successful Opening of Noted Property Has Stimulated Prospecting in Alice Arm District of British Columbia—Active Production Followed Completion of Railroad To Tidewater—Geology of District

BY ROBERT DUNN
Written exclusively for *Engineering and Mining Journal*

THE Dolly Varden mine, in British Columbia, is Canada's newest silver producer of importance, aside from the more recently discovered Premier, from which no large quantity of ore has been shipped to date. By the end of last November, or within five months after production began, the former property shipped over 6,000 tons of ore, which yielded approximately 400,000 oz. of silver. The fortunes of the Dolly Varden attracted much attention during the last year and a half.—EDITOR.

Few British Columbia mining properties have passed through so varied an experience within a comparatively short space of time as has the Dolly Varden mine, situated on the Kitsault River, in the Alice Arm district, in the northwestern section of British Columbia. Discovered prior to 1913, it was first mentioned officially in the report of the Minister of Mines for that year, where it was stated that it was the first claim located on the upper reaches of the Kitsault River, that it was owned by Evindsen & Co., and that a general sample assayed 0.02 oz. gold, 1.4 oz. silver, and 1.2 per cent copper.[1]





LEFT—VIEW APPROACHING ALICE ARM, B. C., SHOWING WHARF IN DISTANCE. RIGHT—MAIN STREET, ALICE ARM

The property was next heard of in 1915, during which season much exploratory and development work, aggregating about 550 ft. of tunnels and crosscuts and 4,500 ft. of diamond drilling, had been done, with the result that a considerable tonnage of very good silver ore was shown up, with indications of ore at greater depth, the metal contents being largely in the form of ruby and native silver in varying proportions, together with some horn-silver. At this time the property was under bond to R. B. McGinnis, of San Francisco, Cal.

Largely through the success attending the opening up of the Dolly Varden, attention had been attracted to the Alice Arm mineral zone, and in 1916 the British Columbia Department of Mines assigned J. M. Turnbull, a mining engineer now at the head of the Department of Mining of the University of British Columbia, to make a general report on the section and on the properties under development there.

Professor Turnbull's report deals, in general terms, with the geology of the country. The Alice Arm mineralized area lies wholly on the eastern side of the great Coast-Range granite (or granodiorite) batholith. The contact with the granite crosses Alice Arm Inlet about four miles from its head, considerably west of Riel's Camp. Its course in a northerly direction for a distance of eight or ten miles is roughly parallel with that of the Kitsault River, which lies about three miles to the east. North of this the contact is not yet determined, but appears to swing more to the west. South of the inlet the contact seems to swing to the east to about the head of Lime Creek.

In the southern portion of the area the rocks are predominantly shallow-water sedimentaries, occurring roughly in the following order: From the contact eastward, slates or argillites, tufaceous sandstones, quartzite, coarse reddish conglomerates with finer beds, and finally, at the head of the Illiance River, volcanic tuffs. The whole has been intruded by a great number of dark gray dikes, which seem to resemble the diorite dikes of the Portland Canal area and have a general tendency to strike in a northeast direction. Other intrusive rocks occur in places, the number of such occurrences being large. In the northern part of the area intrusive rocks seem to predominate, and the sedimentaries are either mere remnants or have been covered up by the igneous flows in part. Between the two a kind of mixed zone seems to occur, which was not followed by Professor Turnbull, except along the bottom of the Kitsault Valley. This zone shows a variety of rocks, slates, intrusives, and mixed rocks, which may be in part volcanic, either tufaceous, breccia-like, or full of inclusions.

The sedimentary series seems to have a general strike to the northwest, more or less parallel to the granite contact, and a general dip to the northeast, with local variations. In general, schistose structure is not con-

[1]This is in marked contrast to results subsequently obtained from thorough sampling.

spicuous. Considerable disturbance has taken place, as is shown by the folding and faulting and the presence of the many dikes and intrusions, as well as by the numerous veins.

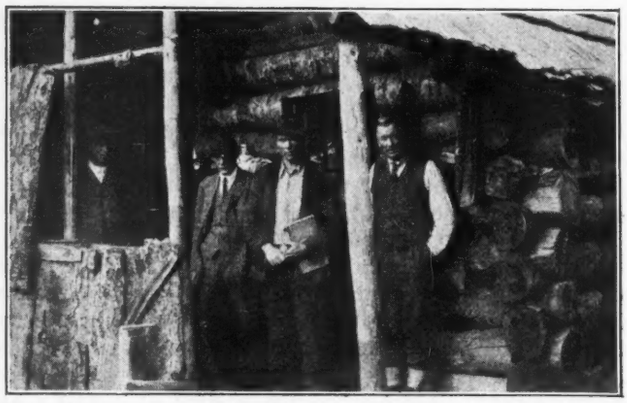
Of the Dolly Varden property as he found it in 1916, Professor Turnbull says, in part: "The mine camp and

BUILDINGS AT DOLLY VARDEN MINE, BRITISH COLUMBIA

main workings, at 1,700 ft. elevation, are situated on the west side of the Kitsault River, the surveyed distance from the wharf being close to nineteen miles. The river at this point is about 1,000 ft. above the sea, and the hillside rises steeply from the water, past the mine, to an elevation of 2,200 ft.; then over the summit slopes more gently down to Evindsen Creek on the west."

After describing the development as consisting at that time of 1,200 ft. of tunnels and raises and 5,500 ft. of diamond drilling, besides numerous open cuts, the report proceeds to deal with the mineralization as follows:

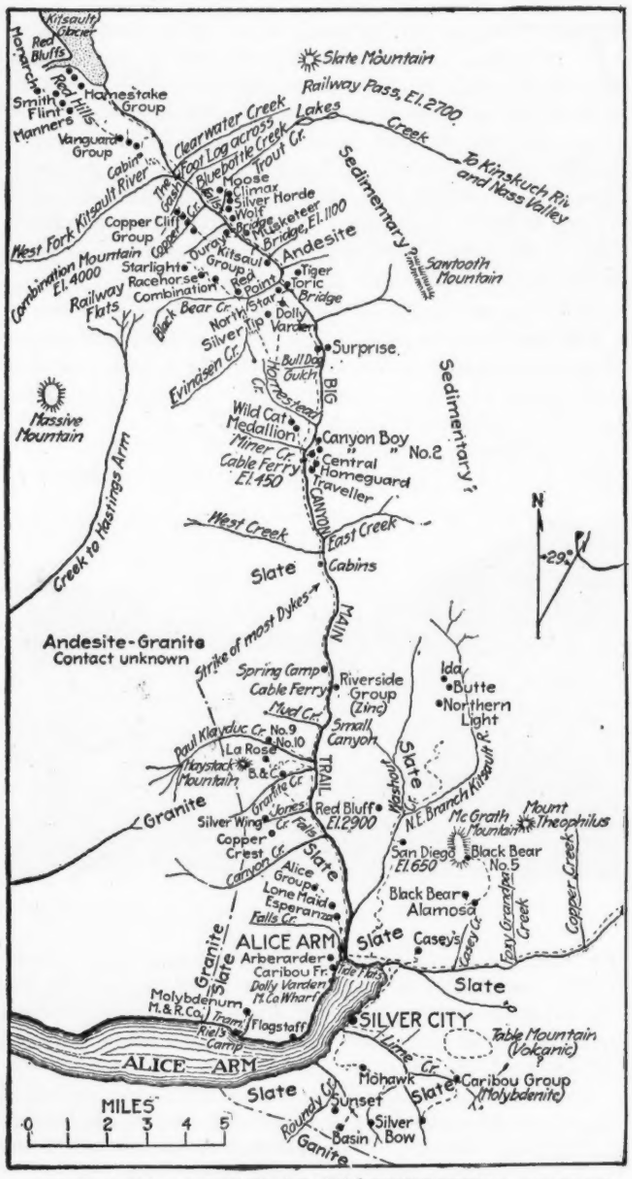
"The vein strikes approximately east and west, with a dip to the north of 45 deg. and upward. Mineralization seems to follow a definite line or fissure, but extensive replacement also appears to have taken place, and ore occurs in widths up to 50 ft. or more. The mineralization consists of quartz, both white and of bluish tinge, accompanied by much pyrite, and smaller amounts of galena, ruby silver, native silver, argentite, zinc blende, and rhodocrosite or rhodonite. In places barite occurs



MINE SUPERINTENDENT AND FOREMAN OF DOLLY VARDEN MINE

in considerable quantity, but it does not seem to be associated with good ore to any extent.

"The original discovery was made on a projecting outcrop about 40 ft. wide. At first only trifling values were found, but on development very high values in silver soon appeared. A tunnel driven on the vein at this point encountered a strong cross-fault at about 50 ft. The continuation of the vein was later found to the north, showing a throw of about 75 ft. This second section behaves in much the same way, and development has continued into a third section still farther north. Judging by surface outcrops this step-faulting is probably local. In general this ore presents great local variations in appearance and occurrence. In the third section good ore occurs, which is not much mineralized in appearance; in fact, it looks like country rock more than ore, and close sampling is necessary to follow it intelligently."



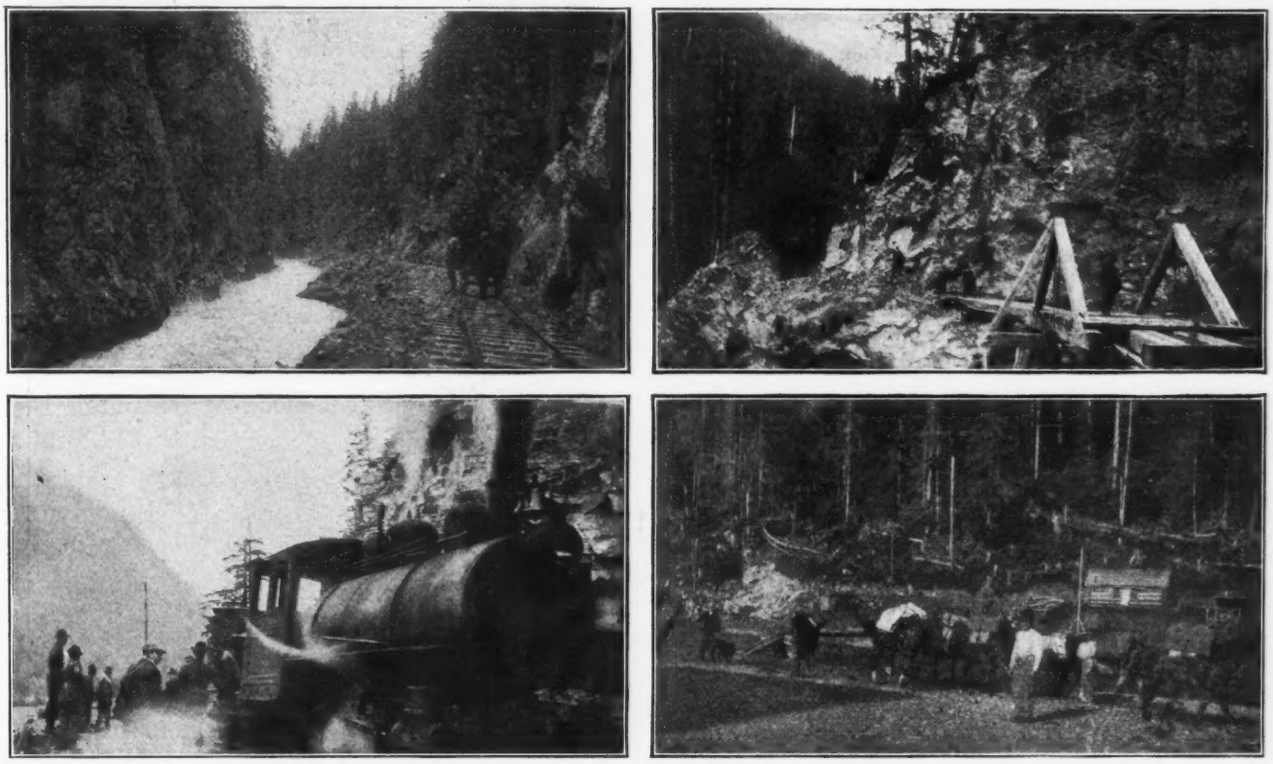
ALICE ARM DISTRICT OF NORTHWESTERN BRITISH COLUMBIA

In 1917 the operators of the Dolly Varden mine incorporated and were empowered to transact business in British Columbia under the Companies Act as the Dolly Varden Mines Co., asking and obtaining special legislation from the province authorizing them to build a railway from "a point at or near the Wolf group of mineral claims, about eighteen miles up the Kitsault River from its mouth . . . to Alice Arm."

Sundry additional privileges were granted the company, which it is unnecessary to enumerate, but it is pertinent to the continuity of the narrative to point out

that it was distinctly set out that "the company shall complete and have its railway ready for operation before the thirty-first day of December, 1918, *in default of which the rights and privileges conferred by this act shall be null and void.*"

The next link in the historical chain is picked up in the report of the Minister of Mines for 1917, which asserted that the property, under the management of Mr. McGinnis, was being brought to a producing basis. The year's development consisted of railroad construction, of driving the main working tunnel, and of further exploration by means of diamond drilling. Of the railroad construction, the contract for which was awarded to the Taylor Engineering Co., of Vancouver, B. C., it is said that "the grade is finished for about twenty miles, but abnormal weather conditions prevented the finishing of more than about eight miles of track."



UPPER LEFT—ALONG NEW RAILROAD BUILT FROM ALICE ARM TO DOLLY VARDEN MINE. UPPER RIGHT—ON RIGHT OF WAY BEFORE COMPLETION, SHOWING UNFINISHED BRIDGE WORK. LOWER LEFT—LOCOMOTIVE ON NEW ROAD ON ONE OF FIRST TRIPS MADE. LOWER RIGHT—AN OLDER METHOD OF TRANSPORTATION, PACK HORSES AT ALICE ARM

Discussing the Dolly Varden and the Wolf groups, with reference to activities during 1918, George Clothier, government mining engineer, said that comparatively little work had been done on either property "for the last two years, the company devoting all its attention to building the railroad from the beach to the mine." As to the Dolly Varden, he says that development has shown that there are thousands of tons of shipping ore in sight and many thousands of milling ore available, and that with transportation and the installation of mining, milling and power plants the property might be expected to develop into one of the important mines of the province.

The railroad was not completed by the date set by the Legislature, Dec. 31, 1918, however, and an application was received at the 1918-1919 session of the Legislative Assembly for an extension of the time allowed for the work. Then opposition developed: A. J. T. Taylor, president of the Taylor Engineering Co., appeared before the Mining Committee of the House and charged that his company had not been paid for what had been done on the railway and that the failure of the Dolly Varden company to meet its obligations had brought him and his associates to the verge of bankruptcy. A thorough investigation followed, witnesses being examined in support of both parties to the dispute, and the result was the presentation to the House of a report of such a character that the legislation hereinafter outlined met with overwhelming endorsement.

This legislation is known as the "Dolly Varden Mines Railway Act, Amendment Act, 1919." It is not my purpose to enter into its provisions in detail, only those salient points being referred to as may be necessary to insure a clear understanding of the intent of the Legislature.

The Minister of Railways by this legislation was authorized to appoint a Justice of the Supreme Court of British Columbia to ascertain the actual cost of construction of the railway, and on receipt of his report copies were to be forwarded to the Dolly Varden Mines Co. and the Taylor Engineering Co. Within twenty-five days after receiving this report the Dolly Varden Mines Co. was to elect whether it would pay the contractors the amount of the actual cost of construction so ascertained. If that was its decision, it was required to make a sufficient payment, within the period named, to meet delinquent labor wages, and given an additional month to pay the balance. If, however, this offer was rejected, the Taylor Engineering Co. was to enter into full possession of the Dolly Varden Mine Co.'s holdings, including the mine, plant, railway, and other properties. Its title was subject to certain conditions. First, it was to pay delinquent wages in cash within fourteen days of

entering into possession, and, second, other obligations were to be paid out of the net proceeds of the premises, and the net proceeds were to be devoted exclusively to this purpose until the debts were liquidated. These charges are set out as being the unpaid balance of the purchase price of certain lots sold by Donald W. Cameron to the Dolly Varden company, together with interest on the amount in arrears; a floating charge in favor of George Wingfield, president of the Goldfield Consolidated Mines Co., upon the premises for the sum of $150,000, and interest thereon at the rate agreed upon under the existing mortgage; and a floating charge in favor of the Dolly Varden Mines Co. for the amount actually spent by the company on the property.

TAYLOR ENGINEERING CO. SECURES POSSESSION OF MINE

This procedure was followed. The Dolly Varden Mines Co. did not take advantage of the opportunity to settle within the time limit. The Taylor Engineering Co. acquired possession, and, under the name of the Taylor Mining Co., has been operating the property.

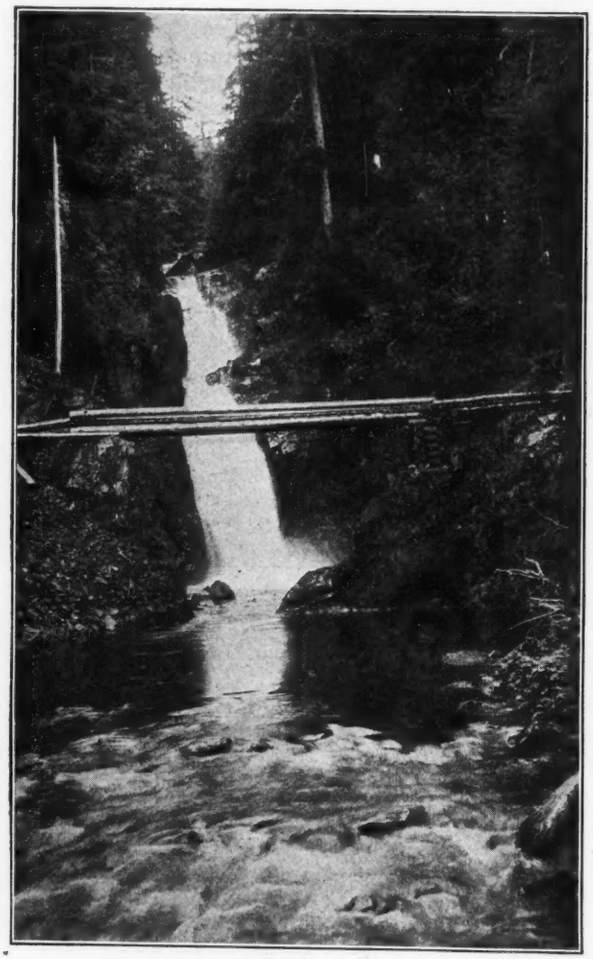
To bring this phase to a conclusion at this point, as far as possible, it may be stated that the Dolly Varden company has given notice that the title of the Taylor Engineering Co. is to be attacked, and representations have already been made to the Department of Justice at Ottawa for a declaration that the legislation described is *ultra vires* of the Province of British Columbia. The first-mentioned company's suit had not advanced beyond this stage up to the time of writing.

With special provincial legislation behind it and an opportunity given for recouping losses if the mine turned out well, and with an ultimate possibility of being rewarded with profits, the Taylor Mining Co. took hold with remarkable energy. Work was taken up where it had been left off on the Dolly Varden railway on June 10, 1919. By Sept. 1 it was completed to a point immediately below the mine, a 2,000-ft. two-bucket aerial tramway with upper and lower terminal bunkers was ready for operation, and mining actually began. Approximately 7,000 tons of ore averaging 56 oz. of silver to the ton was shipped to the smelter of the Granby Consolidated Mining, Smelting & Power Co., Ltd., at Anyox, between Sept. 1 and Dec. 15. In addition, there has been delivered a small quantity of high-grade sacked ore averaging about 1,000 oz.

Though operation of the railway has been suspended for the winter, mining is continuing, ore being stored ready for an early start in the spring. Communication is being maintained between Alice Arm and the mine by means of dog sleighs, and engineers are engaged in making a careful geological study of the property for the company's guidance in mapping out its program for the forthcoming season.

A. J. T. Taylor, as managing director of the Taylor Mining Co., has announced that the railway from Alice Arm to the mine will be extended to the Wolf group of claims, a distance of about two and a half miles. A summer camp is to be opened at Wolf, which is a part of the company's holdings, for the purpose of development, and a water compressor is to be installed. New equipment is to be provided for the Dolly Varden mine, to permit extension of operations, and the rolling stock of the railway is to be increased. The North Star, Toric, Tiger, and Muskateer are among the properties that will be benefited by the proposed railway extension.

Mr. Clothier, in his preliminary report for 1919, says: "By the end of November, or five months from the time work was started, 6,373 tons of ore had been shipped, which will yield approximately 400,336 oz. silver. About forty tons of this was bonanza ore." Again: "The Dolly Varden . . . has made a most enviable record for the short time it has been shipping. This has established necessary confidence in the section, with the result that there are very few properties in the valley that are not being developed or under option. The situation at present gives every reason to believe that next year will see the greatest mining activity yet seen in a quartz camp in northern British Columbia. . . . This feature (referring to the railway), together with the many extraordinary mineral showings in the 'silver belt,' surely justifies a very optimistic outlook for the future."



FALLS ON TROUT CREEK, B. C., THREE MILES BELOW DOLLY VARDEN MINE

That Mr. Clothier's sanguine tone is warranted seems to be conclusively shown by the number of prospects under development and of which he has made special mention. Among these are the Last Chance group, on which diamond drilling was started last season; the Ruby group, situated on the east side of the Kitsault River, opposite the Dolly Varden; the Central group, also on the Kitsault River and on which there has been considerable development and where some very high-grade ore has been extracted; and the Silver Star group on the Illiance River, across the river from the property of the United Metals Mining Co. Here the chief

mineral is galena, with small bunches or veinlets of gray copper, which assay very high in silver, samples running up to $1,900 to the ton.

Mr. Clothier thinks that this is a promising property and that hand sorting no doubt will produce a good tonnage of high-grade ore. These, however, are but a few of the prospects under development. They are singled out only to give some idea of the possibilities of the section.

There is a paragraph in Professor Turnbull's report which gives a good general idea of the area under discussion. It may be interesting, in conclusion, to quote it:

"The river and creek valleys are generally narrow, often canyon-like, with very steep side slopes up to 3,000 ft. elevation, above which the slopes tend to round off, resulting in a large area of generally rounded summits, intersected by creek and river valleys and by lines

VIEW ALONG KITSAULT RIVER, WHICH REACHES TIDE WATER AT ALICE ARM

of sharp peaks 4,000 to 6,000 ft. high, the latter usually flanked by small glaciers, from which most of the creeks take their rise. The main Kitsault Valley is more or less open, though narrow and somewhat U-shaped, except through the Big Canyon, which is very sharply cut, forming a narrow gorge through which the river boils. The canyon cannot be traversed along the bottom, owing to the precipitous sides in many places. It extends from Miner Creek to the bridge above Evindsen Creek, and is in marked contrast to the rest of the Kitsault Valley. It suggests that the andesite through which it is cut is a comparatively recent flow or intrusion. The main tributary creeks are mostly steep in their upper parts and flatten near the mouths, so that while one or two resemble hanging valleys, the latter are, at least, not typical. Few of the creeks in the district seem to head in typical basins. The Illiance Valley is canyon-like in its east-west portion. Its north-south portion is more open and U-shaped, and its appearance suggests glacial scooping out. North of Alice Arm town the valley is wide for a couple of miles and appears to be a portion of the inlet, now filled by river detritus."

Mining in Guatemala

BY BEN T. WELLS

Written exclusively for *Engineering and Mining Journal*

DURING the last three or four years, Guatemala has probably witnessed greater mining activity within her borders than at any time for the last two generations, or perhaps even since the days of the Spaniards, but with the drop in the price of metals nearly all work has gone back to the pre-war state. Many of the primary metals are found in the republic, but none are so situated that economical exploitation has proved possible with normal market prices. The close of 1919 found Guatemala with mining conditions more or less as described below:

Gold was formerly worked in the mines of Guatemala, according to legend, but recently only in placers, and these placers, owing to heavy expenses, are reported to be unprofitable. Large rocks and lack of dump room are given as the causes. There is a large area where gold can be panned, a part of which has for years been economically worked by crude methods, but which has failed with the importation of dredging machines.

No silver is actually being produced at present, but there are a number of places where silver-bearing rock can be found, and a number of old Spanish silver mines are known. In one place, Alotepeque, an old and rich producer is being explored by a long crosscut tunnel which will cut the vein at good depth.

Sufficient lead is mined for local use. It can be found in various parts of the republic, and in the northwest part there is probably one of the largest unworked deposits on the American continent, which undoubtedly will be a big producer in a few years. It is too far from transportation at present to be profitably developed but is well worthy of investigation.

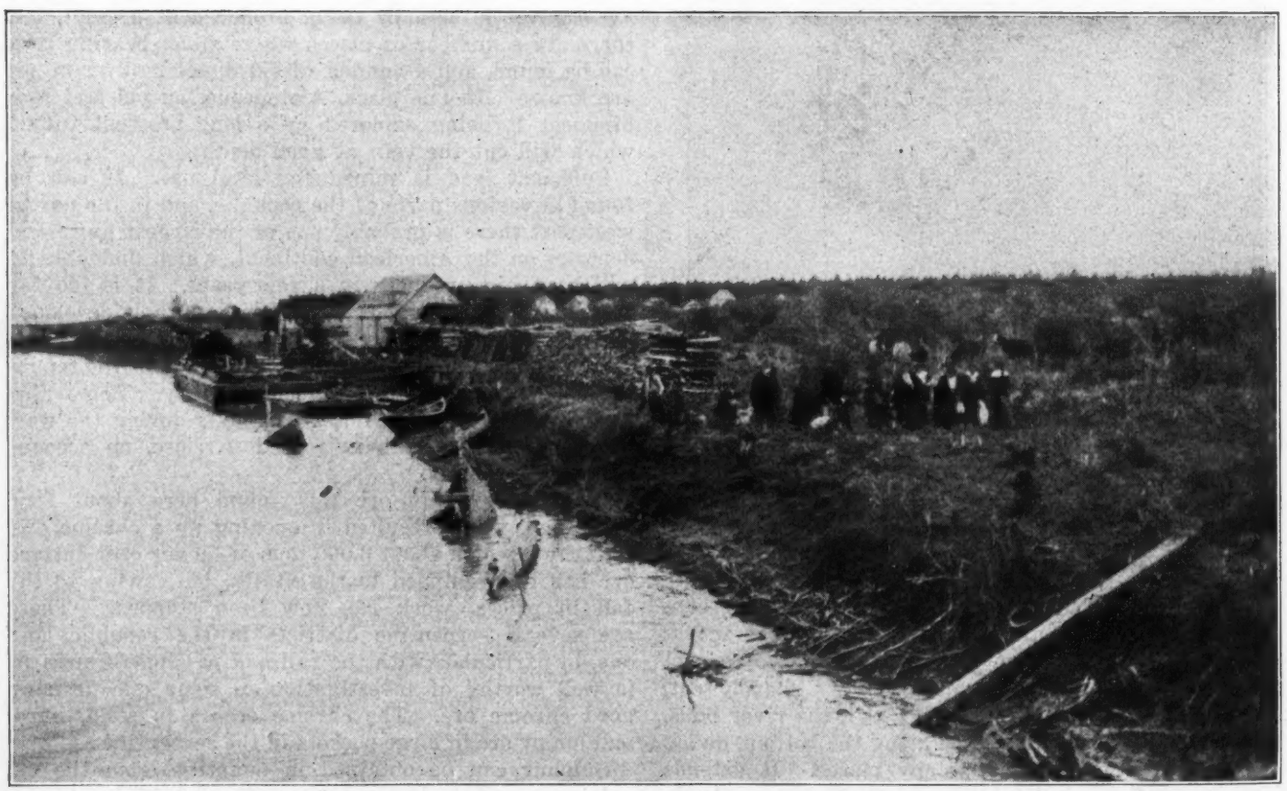
Zinc is also found well scattered throughout the republic, and in two places in good quantity. Some zinc was shipped from the Alotepeque mine during the war, but the mines have been forced to close, on account of heavy freights.

A good chromite ore was found here about four years ago, which resulted in opening up a chrome district from which about 3,000 tons of 56 per cent chrome ore has been shipped to the States, but, owing to the fall in prices, work has now been stopped. There are several serpentine districts in the republic, and one, in particular, with the railroad passing through it, is well worthy of investigation to some one desiring good chrome ore. The chrome occurs in solid, hard, and lumpy ore in large pockets in the serpentine.

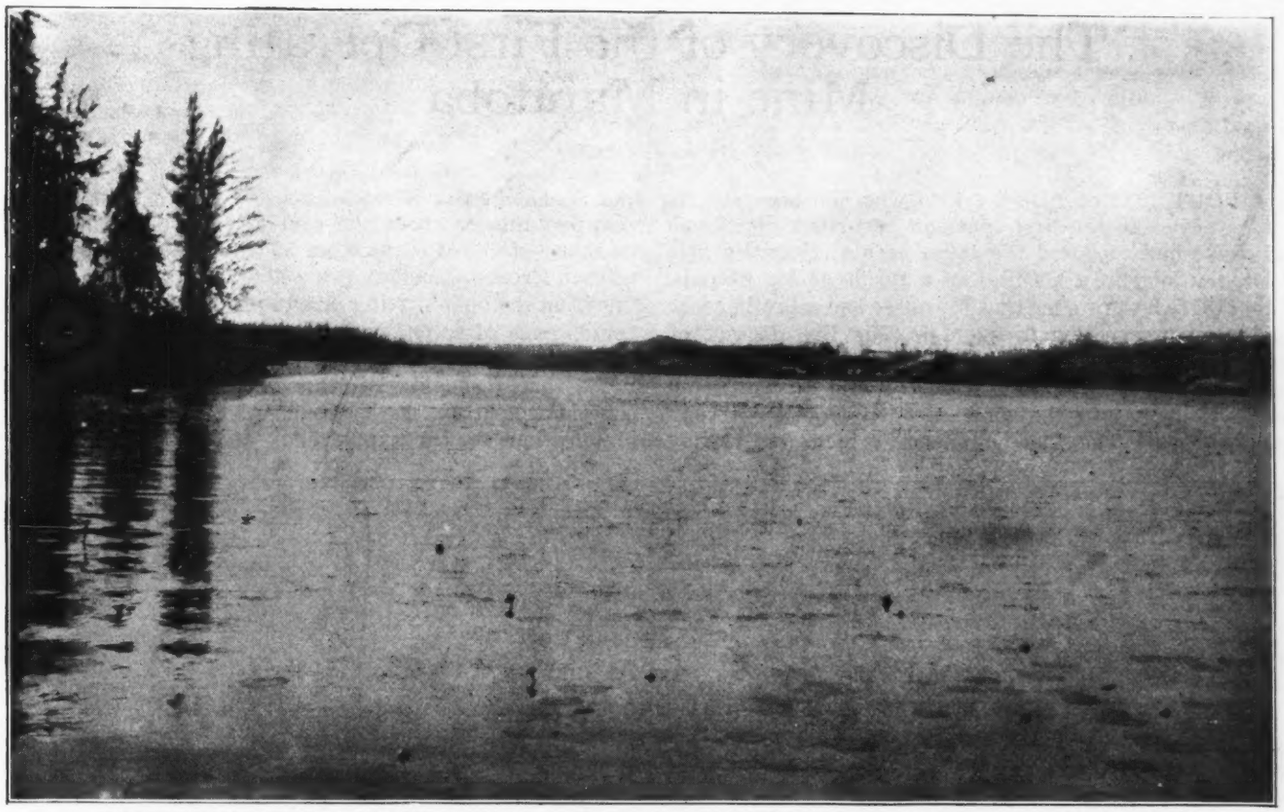
Sulphur can be obtained in quantity from the old volcanoes, and the local needs are thus supplied.

Photographs From Manitoba

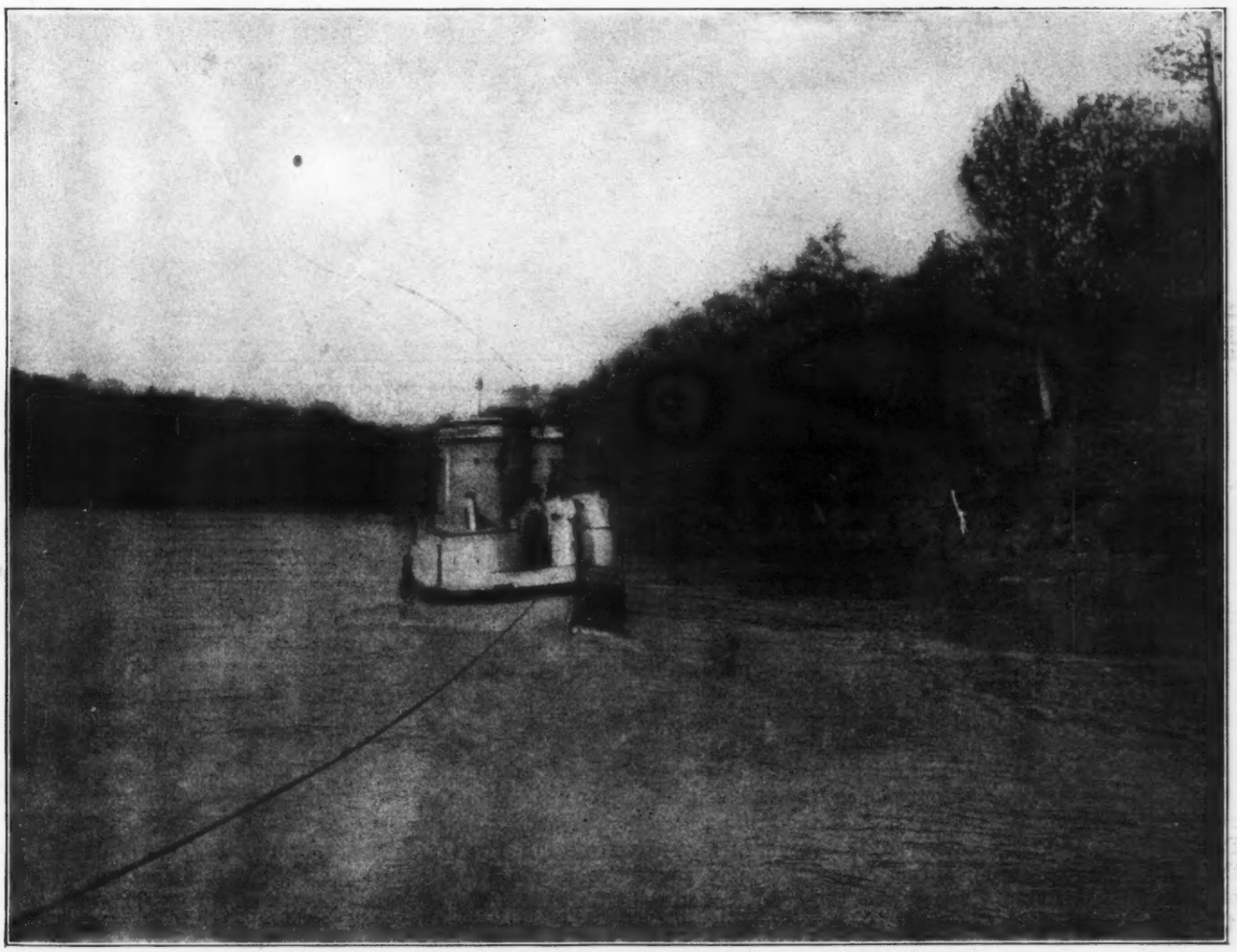
CONTRIVANCE USED TO ICE ROADS IN MANITOBA



HUDSON BAY AND REVILLON FRERES POSTS AT STURGEON LANDING ON THE ROUTE IN TO THE FLIN FLON PROPERTY



LOOKING NORTH UP FLIN FLON LAKE. MINE BUILDINGS LIE TO RIGHT OF WHAT APPEARS TO BE AN ISLAND IN THE CENTER

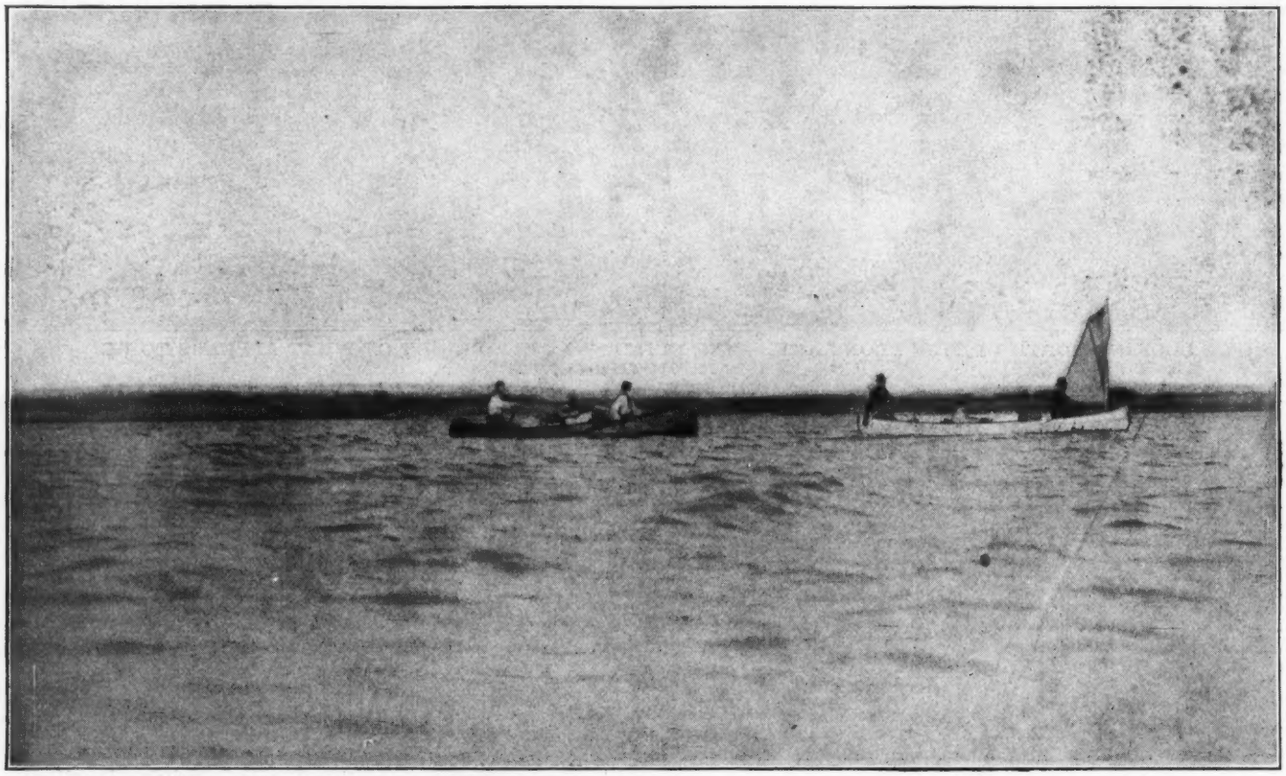


TOWING ORE FROM THE MANDY MINE DOWN THE STURGEON RIVER

The Discovery of the First Operating Mine in Manitoba

By J. E. Spurr

ABOUT 1912 or 1913 a friend who had been shot to pieces in the first Mexican revolution, in which he had espoused the cause of his friend Porfirio Diaz, lay long in a hospital as a result of his wounds. From there he wrote me that his nurse had a brother who had been prospecting for gold in The Pas district of northern Manitoba, and from information gained from her he was of the opinion that it would be worth my while to look into the district. He sent me a copy of the weekly The Pas newspaper, which was mainly concerned with prospecting, strikes, and especially near-strikes, in the region to the north of this northern outpost of civilization, the center of the fur trade from the uncharted wilderness which lies beyond it. I have never heard from this friend since, and if he is still living, and reads this, I hope he will write.



PARTY ON STURGEON LAKE, JUST PREVIOUS TO THE MANDY DISCOVERY. JACKSON CANOE IN REAR

As a result of this and some other rumors I sent up an engineer, D. M. Haynes, whom I had known well in Mexico, to scout. Together with a Canadian mining engineer, George D. Bancroft, whom he found at The Pas, he visited the gold finds on Beaver and Herb lakes, and wrote me that he considered the country sufficiently interesting for me to visit it, specifying the middle of August as about the best time. I was delayed in arriving and only reached there about the middle of September. On getting off the train at The Pas, which is the termination of the northern spur of the Canadian Northern Railroad, from Portage, north of Winnipeg, I found Haynes and Bancroft impatient to start, as travel on the small lakes and possibly over the Saskatchewan River was scheduled to close on account of the ice about the first of October. They told us that a strike of a new kind had just been made by six veteran French Canadian prospectors; this strike, differing from the gold-bearing quartz previously found in the region, was of sulphides in large quantities, principally pyrite, but carrying copper and gold; and they proposed that I should visit this new find on the way to the older gold quartz locations on Beaver Lake. The preparations for the trip, already practically made, were soon completed, and we embarked our two canoes, grub and bedding (eiderdowns) on the little flat-bottomed stern wheeler with which Captain Ross was wont to navigate the great Saskatchewan between The Pas and Cumberland House, the old Hudson Bay post. A friend of Bancroft's, Jackson, a civil engineer who had been contracting on the Hudson Bay Railroad, under construction between The Pas and Post Nelson, on Hudson Bay, asked leave to accompany us, to which I agreed; and he brought with him a mining engineer named Reynolds and his own canoe and outfit.

Arrived at Cumberland House, where the large but shallow Cumberland Lake connects with the Saskatchewan, Captain Ross, to our great disappointment, found it impossible to carry us across Cumberland and Sturgeon lakes to Sturgeon Landing, as he feared the freezing river and the running ice. The night was cold, and there was a flaming and flickering Aurora Borealis. We set out in our canoe the next morning, paddling down the lake, but the wind soon whipped up

choppy waves so high that we had to land in a sheltered place to avoid swamping; and there we passed the night. The next morning the wind was as high as ever; but we spied along the shore a lone sturgeon fisherman, with a stout sloop. He was on his way to carry his catch to market; but we bargained with him to sail with us to Sturgeon Landing, and so were speedily set down there. Thence we arrived, by a combination of river, lake, and portage, at the beautiful Athapapuskow Lake, with its hundreds of rocky islands.

We were now beyond existing maps—only the sketches of prospectors who had gone before, and their lore as to landmarks, guided our guide, Bancroft. From Athapapuskow we traveled along the narrow Schist Lake, then in process of naming; and here we noted that the iron-stained rock gave the first suggestion of mineralization; and, indeed, we knew we were not far from the Flin Flon discovery. We kept to the west shore, but got little protection from the wind sweeping straight down the lake. Arriving at what seemed to be a small island (where now is the Mandy mine), we kept inside the island for greater protection against the choppy waves. It turned out to be a peninsula, and we returned with speed and disgust, for we had counted on making the long swamp (muskeg) portage between Schist and Flin Flon lakes before dark, and it was getting late. Coming back along the shore we noted at one point very heavily iron-stained float at the edge of the woods. We stopped to land and investigate, but we were warned that if we took the time to do so our present day's schedule, and so our whole schedule, would be disarranged. It was agreed, however, that Jackson and Reynolds, after visiting Flin Flon, should return by the way we had come, and should investigate this locality carefully.

The next day we looked over what was to be seen of the Flin Flon orebody, a gigantic lens of pyrite and low-grade sulphides of copper, lead, and zinc, with gold values; and hurried on. The next day or two we traveled over small frozen lakes, the ice on which was too heavy to break easily and too thin to walk on; and my Alaskan experience came in good in devising tracking lines from bow and stern, by the use of which we walked on shore, and guided the canoes, which, weighted heavily in the stern, rode up on and broke down the ice; and so crashed swiftly on. So we came to Beaver Lake, a great body of stormy water; and, alternately landing to avoid swamping, and paddling with a will when the wind slacked, we arrived at the trading post at the other end. After a night here, we worked our way back, by portage, lake, and river, to The Pas. The river steamer had made its last trip; and we paddled for three days down the Saskatchewan against a biting head wind and amid running slush and ice.

FROM LEFT (SKIPPING THE DOGS)—BANCROFT, HAYNES, SPURR, AND MOONFACE THE INDIAN. MOONFACE IS DISCOVERED STANDING ON ONE LEG, HAVING JUST LAUNCHED A KICK AT A DOG, WHICH THE LATTER HAS DODGED. GOING TO STAKE CLAIM ON PARTRIDGE CROP LAKE

We did not think we were any too early in getting back, but Jackson and Reynolds, to our considerable concern, had not returned. The next night, however, Jackson arrived and told us that he had found sulphide ore immediately under the moss at the spot we had noticed and discussed, had scraped off a space three or four feet wide and found no walls; and had located claims, those covering the ore in his own name and probable extensions in the names of friends. He showed me the ore, clean bronze-like massive pyrite, concerning whose value he was in doubt; but I advised him that judging from the peculiar yellow shade, it should contain between 20 and 30 per cent copper. He accordingly recorded the claims, and a written agreement was made transferring his locations to the Tonopah Mining Co., of Nevada, of which I was vice-president and engineer,

MACDANIEL, SPURR, AND BANCROFT, IN THE ORDER NAMED, LOOKING FOR ANOTHER MANDY

leaving him an interest in the property as compensation. Haynes, Bancroft, and myself were in the employ of the company; and of Reynolds, as the novelist would say, more anon.

from Colorado to The Pas, and arranged to have him return to the spot with dog teams as soon as the river froze hard, make camp, and trace the discovery. Meanwhile, Haynes, Bancroft, and myself went up along the

CAMP PITCHED FOR THE NIGHT ON WINTERING LAKE

I immediately sent for an engineer—dear old MacDaniel, who afterward abandoned the Northland and went to Nevada, where he died of pneumonia—to come

line of the Hudson Bay Railway then building, and across the half frozen muskeg on foot to Herb Lake, not yet frozen, on account of its size, and examined the inter-

esting gold prospects which had been found on its shores. We tarried there for a few days, enjoying the clear and snappy air, while a light wind whipped the lake. At last the wind gave way to a complete calm; and although there was no sign of ice in the lake, it was so cold that we concluded to cross the lake to the portage, as it seemed it must freeze that night.

So we started early in the afternoon, and before we had crossed the lake witnessed a most unusual phenomenon. Midway in our passage the lightly ruffled surface of the water became interspersed over increasing areas with an oily calm, and in this, apparent snowflakes—ice crystals—appeared, as if it were snowing above; and for a moment, in spite of the clear sky, it seemed as if this were so. As we progressed, the number of crystals increased, then grouped into a more continuous

OPEN-CUT STOPING OF HIGH-GRADE CHALCOPYRITE, MANDY MINE

mesh, then swiftly formed a thin skin of surface ice. The lake had frozen. The canoes at first broke this thin ice, but it became ever harder to do so; soon we had to break with the paddles ahead, and as we neared the shore it seemed doubtful whether we could break our way to it.

An hour after we landed, our broken trail was solid enough to walk on.

Returning to The Pas, we outfitted with dog teams, sleds, and furs, and returning still farther north along the Hudson Bay Railroad, traveled over various lakes and portages, digging outcrops of mineralized prospects out of the snow, and sampling.

MacDaniel's first cut across the outcrop of the Mandy mine, as Jackson had named it, showed around forty feet of nearly solid sulphides, copper and zinc—averaging about 18 per cent copper and high in zinc. Subsequent cuts, however, proved that the first had been the widest, and later trenching revealed the surface outcrop as lenticular and a little over 200 feet long. Diamond drills were sent in to determine the depth, and revealed the lens pinching to narrow dimensions in about 200 feet.

The high-grade copper lay in masses and layers separate from the zinc ores and the mixed ores, permitting separate mining; and the then high price of copper determined the plan of mining and shipping this copper ore. Mining equipment was hauled in over the ice, and when installed the ore was systematically mined; and in the winter it was hauled across lakes and portage by horse-drawn sleds to Sturgeon Landing, where in the spring it was loaded into specially built scows and towed to The Pas, where it was loaded on cars and hauled to the Trail smelter, British Columbia.

This richest part of the orebody has now been mined out, corresponding almost exactly in tonnage and grade with our estimates. The zinc ores and the mixed ores await the installation of a process for separating the minerals; and this, in part, upon the possibility of the equipment of the Flin Flon property, which has been under option several times to large interests. The Flin Flon is low grade, and cannot operate profitably without a railroad.

GOVERNMENT LIBERAL, BUT LIMITED TONNAGE HALTED DEVELOPMENT

The Government of Manitoba was very liberal and helpful as regards our mining enterprise, but our limited tonnage did not warrant railroad construction.

Further development of the Mandy mine may well disclose other lenses similar to that which has been exploited.

The sensation attending the opening up of the Mandy mine caused Reynolds, Jackson's companion, to sue him for a half interest and to have his agreement with the Tonopah company cancelled. The courts awarded to Reynolds half of Jackson's interest, but sustained Jackson's agreement with the Tonopah Mining Company, and although the latter part of the decision was appealed by Reynolds, and carried through the courts up to the Supreme Court of Canada, it was always confirmed.

That there should be other mines in the still wild and unmapped regions north of this frontier is a natural thought; and logical, in view of the geologic condition. Ore deposition has been connected with granitic intrusions, and explorations in the broad vicinity of the granitic contacts are most likely to show results. As discussed in the editorial pages of this issue, the airplane of the hydroplane type may enable the prospecting of the unexplored area a hundred years earlier than otherwise.

In Which the Inaccuracy of One Statement Proves the Truth of Another

Lord Fisher, Admiral of the British Navy, says in the London *Times:* "Well, the comforting thing is that the earth has only been hitherto scratched for oil. There is no part of the world—though I am not a geologist—where, if you only go deep enough, you will not get it."

Annual Meeting of the Canadian Mining Institute

STAFF REPORT

By telegraph to *Engineering and Mining Journal*

THE twenty-second annual meeting of the Canadian Mining Institute was held at the King Edward Hotel, Toronto, March 8, 9 and 10. About 175 delegates attended the conference, which was called to order on Monday at 11 a.m. Harry Mills, the new Minister of Mines of the Farmer-Labor Government of Ontario, gave a talk, in which he dwelt on Ontario's position in mining and her needs and opportunities.

Mayor Tom Church of Toronto then welcomed the visiting engineers. He spoke of the possibilities in the electro-thermic smelting of iron ores and said cheaper power was required. Only 500,000 of Ontario's possible 6,000,000 hydro-electric hp. has been developed, and this should be increased. Mr. Church also said transportation costs were too high, and criticized construction of three transcontinental railroads when one double-track road would be ample. He said that the people of Canada had put $900,000,000 into railways, and that improving inland waterways and canals was one way of helping transportation. Mr. Church also spoke of the excellent men the Canadian universities had turned out and said that they were largely instrumental in developing the mineral industry of the country.

The presidential address by D. H. McDougall was then read. The title was "Economic Utilization of Natural Resources."

John McLeish then read a short paper, and afterward T. W. Gibson read excerpts and comments on the mineral production of Ontario in 1919.

T. C. Denis, Minister of Mines for Quebec, said a few words on Quebec production.

The morning session wound up with the paper by James McEvoy on the status of the Canadian engineer.

The afternoon meeting began about 3 o'clock. The program as announced was not followed, as none of the papers had been printed.

The first paper presented was a short report of a committee on education, read by Dr. Goodwin.

W. H. Collins then presented orally his paper on the "Iron Ranges of the Michipicoten District, Ontario," illustrating it by blackboard sketches. He brought out the importance of Michipicoten as a mining district and field for prospectors. It first came to notice in 1897 as a gold district, but the gold was not found in sufficient quantities, and attention was turned to iron. Later the district proved to be of importance as a source of pyrites.

The Helen mine, opened in 1900 and closed down in 1918, produced 2¾ million tons of soft hematite. It is now exhausted. The siderite deposits of the New Helen are now being developed. From seventy to one-hundred million tons have been proved by diamond drill. Mining and treatment are no longer experimental. Much experience has been gained from operations at the Magpie mine since 1913, but the mine has not been a financial success. Several other small deposits are known, and there is plenty of ground to prospect and develop. The pyrites industry has been developed since 1913, and production at the Goodrow property has amounted to 100,000 tons a season.

W. H. Collins then took up results of geological exploration, which he illustrated with much blackboard work.

Hematite, siderite, pyrites and gold are present in the district. All except gold are in the so-called "iron formation," which originates in Keewatin rocks. The latter have been eroded considerably and stand on edge for the most part. The iron formation is distributed through the volcanic rocks irregularly and probably originated in volcanic waters. The structures are difficult to determine. Prof. Coleman, J. M. Bell, and Mr. Parsons have done considerable work in this district and have described geological strata.

These strata are as follows: The top band consists of basic volcanic rocks and greenstone; then comes banded silica, pyrite, siderite, and acidic tuff. These occur in folds on the Goodrow property, and the structure is easier to determine here than at some other places.

Diamond drilling should be done from the bottom of these folds (some may be inverted or stand edgewise), as the banded silica is very hard. The pyrite is richest near the silica and gets leaner as it goes down.

It has been determined by Coleman that a prospector in following an outcrop band should turn to the left on encountering a dike and explore the country in that quadrant. Some of these faults shift the deposit for 1½ miles.

Prospectors can use a dip needle to help find the faulted orebody, as it probably contains some pyrrhotite.

The pyrites sands at the Goodnow stand at the water level. Some of the pyrite deposits are caused by solution from older ranges and reprecipitation. At the Goodnow the pyrite contains about 10 per cent pyrrhotite, 1 to 2 per cent Mn and 1 to 1½ per cent Zn. Near the bottom of the strata it is admixed with siderite.

The Holdsworth deposit, also mentioned, contains about 900,000 tons of high-grade ore. This occurs in a lens standing on edge and may have also come from solution. This lens type of deposit is very difficult to locate, as it occurs in low ground, and contains no pyrrhotite, and consequently the dip needle is of no use, and outcrops are very narrow—only 2 or 3 ft. wide at Holdsworth.

Some discussion followed this paper. It was stated that the Magpie ore, siderite, ran about 35 per cent Fe, which was brought up to 50-51 per cent by washing. The CaO and MgO present made it almost self-fluxing.

The gold is not found with the iron, but only in volcanic rocks.

The importance of the government granting a bounty on iron ores was emphasized. They require this bounty to promote a more rapid development of the district.

The second speech was by Percy Barbour on "What the Mining Engineer Did in the United States in 1919." No single big thing in mining engineering was initiated or completed, but the mining engineer was employed to good advantage. Mr. Barbour discussed the engineer's place as a citizen and spoke of amending the constitution of the A.I.M.E. so that problems of the moment could be taken up.

The year began with strikes from Jerome to Butte and from Colorado to California; also curtailments by employers. Later, employers couldn't pay the high wages demanded and strikers couldn't live on wages that were paid. Mr. Barbour spoke of the Miami Copper Co., which had to curtail operations or cut wages, and which took the whole question up with employees, even calling in shift bosses. The company put all its cards on the table and all difficulties were amicably adjusted. The employees accepted a cut in pay, and had little hard feeling. Mr. Barbour said that this is a good example of how to do it.

Concerning the problem of returned soldiers, Mr. Barbour declared that the mining companies all gave the men their former jobs, but many wanted better positions after being in charge of groups in France. The four national societies formed an employment bureau, which put 20,000 men in touch with positions in 1919.

Mining engineers are also concerned with impending legislation, said Mr. Barbour. The War-Minerals Relief Act, he declared, had "broken many hearts and killed much patriotism." He instanced the company which had built a railroad for $160,000 at the request of the Government, but which saved $56,000 by the use of it, and so put in a claim for $104,000. The claim was thrown out because the company had made a little money on its total business.

Referring to the licensing of engineers, Mr. Barbour said that mining engineers were against it. The Engineering Council has drawn up a bill to submit to states that desire this legislation. It was pointed out that with divergent state laws a consulting engineer with a wide field of activity would be in trouble. Oregon, Mr. Barbour said, had a law affecting mining engineers, but mining engineers of California and Colorado had killed or altered similar bills. Twelve states have passed licensing laws, but they are designed to apply particularly to structural and architectural engineers.

Mine taxation, declared Mr. Barbour, is a problem which is practically a stone wall. The United States Government has asked the A. I. M. E. to submit a report, but mining engineers cannot understand just what the Government wants, and the United States can't tell them.

Respecting the position of gold miners, the schemes put forward to subsidize the miner, and also to tax gold used in arts, Mr. Barbour said that the good old law of supply and demand must not be disregarded. He spoke of the interest in C. V. Corless' paper on education and industrial democracy. Also, to the paper by W. R. Ingalls on "Industrial Co-operation," and Mr. Ingalls' supplementary papers.

Mr. Barbour discussed the movement of Winchell and Hoover to solve the bituminous coal problem. This was followed by an open forum. The views of everyone in the industry were being sought, and it is hoped that definite results will be accomplished soon.

Following Mr. Barbour's address, "Molybdenite in the Lower Ottawa Valley" was discussed by M. E. Wilson. This paper was illustrated by good lantern slides. Mr. Wilson said:

"The statements emanating from various sources that molybdenum steel posesses important advantages for certain special purposes, and the numerous requests with regard to the available supply of molybdenum in Canada that are now being received from Europe, seem to indicate that a more active demand for molybdenite may be anticipated in the near future. It may be of interest, therefore, to inquire just how much molybdenite ore is actually in sight in Canada at the present time and what the future possibilities of the industry will be in case the demand on the mineral should increase. The present paper is an attempt to answer these questions, for that part of Canada from which the greater part of the war-time production of molybdenite was derived, namely the Ottawa Valley. The region lies along the southern border of Laurentian highlands and is underlain by formations known as a basal complex. The latter are not yet completely worked out, but are probably composed of three principal groups of rocks: (1) Metamorphosed marine sediments called Grenville series; (2) igneous pyroxenic and hornblendic rocks; (3) batholithic masses of granite, and syenite gueiss intrusive into (1) and (2). The types of deposits are (1) segregations of pyrite, pyrrhotite, fluorite, and quartz in quartz syenite. Molybdenite occurs in thin seams and as scattered flakes in this syenite, but chiefly disseminated in siliceous pyritic aggregates. Five such masses have been discovered, but all are too small to be of importance. This kind of a deposit was worked by the Dominion Molybdenite Co., and most molybdenite from the Quyon district was mined by that company. The zone was about 500 ft. long, 60 ft. wide and 250 ft. deep. The central mass was 200 ft. long, 50 ft. wide, and 75 to 125 ft. deep. Average MoS_2 content was 1½ per cent in upper part of central ore mass and 0.75 per cent or less in the lower part. The Dominion Molybdenite Co. obtained 800,000 lb. of molybdenite from this deposit. (2) Veins of pyrite, pyrrhotite and quartz in granite gneiss. These differ from (1) chiefly in form. The veins are a foot or less wide, irregular and discontinuous. Examples of the second variety are to be found on properties of the International Molybdenite Co., in Brougham Township, and on the property of the Steel Alloys Corporation in Griffith Township, Ontario. The Spain property has veins close together, and so can mine the whole mass with a molybdenite content of near ½ per cent. (3) Pegmatite dikes or pegmatitic quartz veins. These are common in the lower Ottawa valley, but are too low grade or too small to work. (4) Contact metamorphic deposits, which are the most common. This form occurs where granite or pegmatite are in contact with the limestone of the Grenville series or where pyroxenite occurs as an inclusion in the granite or pegmatite. An example is afforded at the property of the Renfrew Molybdenum Mines, Ltd., in Brougham Township, Ontario, where the average molybdenite content is 0.95 per cent. This is the second most important molybdenite mine, its total production up to the present being 100,000 lb. When the mine closed down the known ore was nearly exhausted, but it probably could have developed much more. This type of deposit is most common, and about fifty such deposits are known.

All molybdenite mines ore now closed down, and not much ore is being developed—possibly enough (altogether where there are now no mills) to run a 25 to 50 ton a day mill for several years on an ore averaging around ½ per cent MoS_2, which could be cobbed up to 2 per cent.

The Steel Alloys Corporation is now doing development work. If it were certain that present prices

would continue, some molybdenite would probably be produced. Future production awaits demand, and no doubt a large amount can be opened up if it is later required.

After the reading of Mr. Wilson's paper the afternoon meeting then adjourned. Afternoon tea was served on the balcony floor from 4.30 to 6 o'clock, at which many ladies were present.

Monday Night Session

At the meeting of the convention on Monday night, J. C. Nicholl, general superintendent of the International Nickel Co., described the mining and smelting operations as practiced at the company's plant. He said that the Creighton mine is one of the best equipped and most highly developed in the world. Shrinkage stoping is a general practice; ore is being hoisted only from the fourteenth and twentieth levels, the material being dropped through raises from the upper levels. An underground jaw crusher reduces the ore to six inches. This is of great utility, as it makes possible quick and economical hoisting. The skip stops less than ten seconds for ore before starting up, including waiting for signals, all of which are repeated. The headframe and rock house are 165 ft. high, the walls being of hollow tile, that method of construction proving a successful experiment for keeping the building warm. The ore is hand-sorted on picking belts, and thence sent to the roast yard, where it is transferred to special side dump cars, discharging on an inclined conveyor belt to an ore bridge spanning the roast yard over a width of two beds. The ore is automatically distributed on the beds, this superseding the former hand distribution by wheelbarrows. The new arrangement is entirely successful. The roasted ore is dug out by steam shovels and shipped to the smelter, where it is smelted in blast furnaces to a standard matte, which is resmelted in converters to a high-grade copper and nickel matte.

The lecture was well illustrated with lantern slides. The only question that was raised was that put by Dr. H. M. Payne as to how the hanging wall was supported. The answer was that it was in part caved and in part supported by waste. Following Mr. Nicholl's talk, moving pictures of the Cobalt silver camp were presented by the Ontario Government. These consisted largely of operations at the mine, mill, and bullion refinery at the plant of the Nipissing Co. The pictures were exceptionally clear and informative. The government is now engaged in taking moving pictures of the Porcupine gold camp, also. The last series shown depicted operations at the Alfred peat bog, in Ontario, forty miles east of Ottawa. Automatic excavators are employed in recovering the peat. The peat is then macerated while containing 88 per cent of water. The conveyor belt and the distributing machine spread the macerated peat on the ground, where it is allowed to dry. While still damp it is passed over a ribbed roller, which cuts it into blocks. The dry blocks are then turned by hand, piled, and finally shipped. The peat sells for $3.50 per ton, f.o.b. cars. These operations were illustrated with slides and an excellent motion picture taken by the Ontario Government. The industry is operated jointly by the Ontario and Dominion governments. The product is used in stoves and in fireplaces, and, when mixed with coal in furnaces, develops between 9,000 and 10,000 heat units. The illustrations of peat recovery and treatment ended the afternoon's entertainment.

Tuesday Session

On Tuesday morning papers were presented on coal. Luncheon was tendered to the delegates at 1 o'clock at the King Edward Hotel by the city authorities, which was followed by speeches by Mayor Church, President McDougall, and Bradley Stoughton. Mr. Stoughton was well received and made an interesting address. On Tuesday afternoon about fifty of the delegates went to the Goodyear Rubber Manufacturing Co. plant.

Only two oil papers were presented at the session beginning at 2:30 p.m., one by Dr. M. Y. Williams and one by D. B. Dowling. Dr. Williams confined his remarks largely to possibilities of oil and gas production in southern Ontario, as the government report of investigations in northern Ontario had not yet been published. He suggested that the western section of southern Ontario was most promising, but only a few holes had been drilled there, and the speaker was not particularly enthusiastic.

The papers presented by W. F. Gray, A. Maclean and Edgar Stansfield were well received, the latter proving to be exceptionally interesting. Mr. Stansfield described the piston and roll devices of machines and discussed the question of getting a suitable smokeless binder. The Canadian government has not yet developed fuel oil briquettes which are commercially satisfactory.

On Tuesday afternoon a paper on coal was presented by M. A. McInnis. This was in addition to two papers on oil.

The oil paper by Mr. Dowling drew attention to the fact that the unbroken areas of western Canada were most important as sources of oil. The depression east of the Rocky Mountains is in his estimation a poor place for investigation, as oil, if it is to be found there, would occur at great depth. Mr. Dowling considers the Middle Devonian as the most likely oil formation, and believes that investigation should be confined to areas where these rocks can be easily reached. He expressed the opinion that there are opportunities for oil exploration work at the edge of the uplift. Wyoming and Colorado oil are found at the edge of depressions. The high-grade oils within 50 to 60 deg. Bé. are probably distillation products from petroleum existing at lower levels. He mentioned oil seeps on the Great Slave Lake and the oil springs and shales along the MacKenzie River. Cretaceous rocks lie on top in these districts, but the oil probably seeps up through fissures from the Middle Devonian. The Peace River wells are about 1,100 ft. deep, and average approximately ten barrels daily. The drillers were not satisfied, and drilled deeper, flooding the wells with salt water and seriously injuring the field. Mr. Dowling thought it would have been a good plan to drill below where the salt water occurred, in order to reach the Middle Devonian, where more oil might have been encountered. Oil has been found in Cambrian and Pre-Cambrian formations, and these occurrences have been studied by government geologists. Dr. T. O. Bosworth in his paper on oil in western Canada expressed the opinion that the oil belongs in Cambrian and Pre-Cambrian formations, but Dowling is of the opinion that an overthrust has occurred. The oil is very light and is probably a distillation product from other formations.

The smoker held on Tuesday evening was a great success. There were entertaining musical numbers, and many good stories by visiting delegates. The fact that the neighboring province—Quebec—is "wet" added not

a little to the success of the occasion. A parody on the popular ditty concerning the "Smiles That Make Us Happy" ran:

There are mines that make us happy,
There are mines that make us blue,
There are mines that steal away the tear-drops
As the sunbeams steal away the dew;
There are mines that have the ore-shoot faulted
Where the ore's forever lost to view,
But the mines that fill my heart with sunshine
Are the mines that I sold to you.

"Foghorn" McDonald, known throughout the North Country, sang "Drill, Ye Terriers, Drill."

Wednesday Session

On Wednesday morning the first paper, on "Expectations," by G. R. Mickle, was rather brief. It outlined a system of judging the profits of gold and silver mining companies as a basis for taxation. It also showed what proportion of gross profits was expended in various fixed charges for the years 1917-1918. It was illustrated by lantern slides. The speaker stated that similar figures should be drawn up for at least twenty years, to find out how these mining industries stood as a whole; then, knowing past figures, future conditions could be judged and proper taxes or bounties levied. Mr. Mickle is the mine assessor of the Province of Ontario. There was little discussion of this paper.

The next address was by the Hon. John A. Campbell, Member of Parliament from Manitoba. He spoke from the standpoint of Manitoba and the prairie provinces, stating that mineral deposits have been discovered in northern Manitoba in three areas—Star Lake, Rice Lake and a vast region north of The Pas, the latter territory stretching 140 miles on Beaver Lake to Herb Lake. In this area copper is the most important mineral, but there is some gold. The Mandy mine is a spectacular deposit. It has been shipping high-grade copper ore for three or four years, but has shipped nothing this winter, although 15,000 tons was sent out the winter of 1918-1919. The ore is hauled forty miles to Sturgeon Landing by team, thence by boat 130 miles, and then by railroad 1,500 miles to the Trail smelter in British Columbia. This ore is worth over $100 per ton. The high-grade chalcopyrite ore is now exhausted, and a railroad will be required before the low-grade ore can be worked. There are still 8,000 tons of high-grade ore at Sturgeon Landing dump, which will be shipped this summer. Diamond drilling has proved 200,000 tons of $50 to $60 ore.

About four miles from Mandy is the Flin Flon deposit, where 18,000,000 to 20,000,000 tons of $8 to $10 ore has been proved by two years' diamond drilling. This deposit requires a smelter on the ground, which would necessitate an eighty-mile railroad from The Pas. The building of the Hudson Bay Railroad has materially aided the development of the district. At Herb Lake the Rex gold claim has shipped some ore, but is now closed down, awaiting return to normal conditions. Almost no development has been done.

Mr. Campbell set forth that the resources of this district should be developed. The Dominion Government, he stated, now owns the natural resources of the three prairie provinces, Manitoba, Saskatchewan, and Alberta. It has given its promise to turn these resources over to the provinces, but nothing has been done. The Dominion has no mining law, but only mining regulations, which are frequently changed, so that the mining operator never knows where he stands, and points are continually coming up which are not covered in the regulations. There must be decided, also, the question whether prospecting should be free or licensed, and also whether leases or grants should be issued to discoverers and locators of mining claims. The Western operators are against the leasing system, but the main thing is to get a safe title under any name. The provision in the Dominion regulations as to royalties on ores produced is indefinite and unsatisfactory, and is now being revised. It is important that the royalties should not be so large as to absorb all the profits.

Mr. Campbell, continuing, praised the Canadian Geological Survey members very highly, and entered a plea for higher salaries. He also urged the necessity of a real department of mines and a real mining law, and discussed the plan of forming prospecting parties of returned soldiers, who would receive small salaries and part or all of what they find. The Dominion Government has turned down this plan, but the provinces might do well to adopt it.

In conclusion, Mr. Campbell stated that the mineral resources of middle north Canada must be developed in order to pay the national debt, and that the *laissez faire* policy must stop.

In discussion, George C. Bateman said that certain interests had just purchased a share in the Mandy mine, and that $60,000 worth of supplies would be sent in before the break-up.

Mr. Louis Simpson then delivered an impassioned appeal to let mining machinery not made in Canada come in duty free, saying that present customs laws favor big interests and are unduly hard on prospectors and developers. He cited the case of several New York investors who had intended to expend $5,000,000 in developing the oil shale of eastern Canada, but who refused to proceed when they found that over $1,000,000 would be required for duty on machinery.

The next paper was by J. B. Porter and was a report of the Committee of Engineering Standardization. The speaker would like to hear from all those who have had troubles because of the lack of standardization.

Wednesday morning's session was closed by the presentation of W. S. Landis' paper on cyanide. In the course of his address Mr. Landis explained that cyanide has many uses besides those incident to mining. Before 1917 there were only two processes of cyanide manufacture. The Castner process was the most common, but it was never installed in Canada. The process makes a 96 to 98 per cent product. Another process of cyanide production used to some extent in Germany employs a waste product of the sugar-beet industry. High prices in 1916 caused the American Cyanamid Co. to employ a new process. The first unit of a new plant at Niagara Falls, Ont., was started in January, 1917. Cyanamid is a cheap nitrogenous fertilizer. It is mixed with common salt and melted in an electrolytic furnace. Power, temperature requirements, and upkeep expenses are small.

The furnace is tapped continuously and the cyanide is cooled in black flakes. Lime and salt are the principle impurities, and sodium cyanide equivalent to 22 per cent was produced in 1917. A continuously operating furnace was developed in 1918, and the grade of the product was raised to 30 per cent. In 1919, the grade was further improved to 36 per cent sodium cyanide equivalent, and this product was called Aero brand.

Grade X. At the end of 1919 Grade XX, which is a 46 per cent cyanide, was put on the market, and the company expects within a few weeks to raise the grade to better than 50 per cent.

The cyanide flakes, as produced, are less than one-sixteenth on an inch thick and are from one-quarter to one-half square inch in area. They dissolve readily by agitation anywhere within the mill circuit. Dry cyanide is packed in 400-lb. drums, which must be kept dry. Calcium carbide is present in small quantities. This liberates acetelyne, so that mills must be ventilated. It must not be added to a pregnant solution, as the gold would be precipitated. There is absolutely no danger connected with its used, as has been reported. It has been tested for use in Mexican mills with exactly the same results as an equivalent amount of high-grade cyanide.

There was no discussion on this paper.

On Wednesday afternoon Dr. Harvie presented his paper on the "Geology of Quebec Asbestos Deposits." This was followed by a paper on nickel coinage by C. E. McDonald. Mr. McDonald went into the history of the subject and presented the advantages this metal possesses for this purpose. He recommended its adoption by Canada on economic as well as sentimental grounds. He said that pure nickel was preferable to any alloy. Considerable discussion followed, everyone seeming to be in favor of the suggestion, and a resolution was prepared asking the Canadian Government to consider minting five- and ten-cent nickel coins.

The next paper was by A. P. Coleman on "Lost Placers of Ontario." Mr. Coleman said that in the Porcupine and Cobalt areas there had been eroded millions of tons of ore, and this was no doubt lying in placer beds somewhere. He suggested that it was probably under the old Paleozoic rocks of the Hudson Bay slope. He thought the silver might lie under the clay belt, and probably more silver had been eroded than had been mined.

J. G. McMillan's paper, an interesting account of "Recent Developments in Mining in Northern Ontario," gave the following: The principal factors causing changes at Cobalt were the price of silver, the lower-grade ore at present mined, and the use of flotation. The cobalt in residues sold for about 50c per lb., but was at one time up to 70c. Before the war 75 per cent extraction was obtained from 20-oz. ore. Cyanide mills recovered 10 to 15 per cent more, but this system was too expensive for adoption by small mills. The first 600-ton Callow flotation plant was started Sept. 19, 1916, by T. L. Jones, of the Buffalo mines. Today the flotation plants total 1,600 tons' daily capacity.

Stamp batteries are now equipped with two- and three-mesh screens instead of fourteen mesh, and regrinding is done in tube mills. Coniagas in 1914 made a four to five ounce table tailings. At present on a 10-oz. ore, flotation tailing runs 1 oz. The rougher cells give a 30-oz. concentrate, the first cleaner a 100-oz. concentrate. Sodium silicate is then added. The third cleaner gives a 200-oz. product and the fourth cleaner a 500-oz. concentrate, which is shipped. One company treats its own concentrates by a chloridizing roast; leaching and the precipitation of the solutions is made on copper. The copper which enters the solution is recovered by precipation on iron.

In mining some of the stopes are from 30 to 40 ft. wide. Coniagas now has two stopes over 60 ft. wide, the greater width having been obtained by the removal of pillars and slabbing off the sides of the stope. Leyner drills are in use.

Miller Lake-O'Brien, in the Gowganda district, has produced 1,000,000 oz. yearly for three years. In the Porcupine district the Hollinger mine has now twenty-seven miles of underground workings. One thousand feet of diamond drilling is done weekly, and 450 ft. of development work. The ore averaged last year $9.44. The number of men employed averaged 1,207. The daily tonnage treated was 2,300 tons. The deepest shaft is on the Acme property and is 1,320 ft.

Hollinger has been experimenting this year with the Armstrong shovel, a mechanical mucker. It has not proved to be an entire success, but it is thought that it can be modified to suit the underground conditions at this property. This type of machine has also been ordered by the Dome and McIntyre for trial. The McIntyre has the deepest shaft in the camp, 1,550 ft. The ore becomes consistently wider and grows better with depth. Mechanical haulage is used on the 900 and the 1,000 levels.

Dome has established a record for the district of seven tons mined per man per day underground. For the total number of men the tonnage ratio is three tons per man per day. The Crowe vacuum process, first used at Teck Hughes, is now used also at the Dome and McIntyre. The new Dome refinery is a model plant. The Dome uses only one-quarter of the amount of zinc required before the Crowe process was installed.

Kirkland Lake, an interesting gold district, has six mines, employing 300 men. One shaft is down 700 ft. Other properties were discussed. The author made a plea for engineers to manage mines and said the Miller Independence had been run by a man who spent $100,000 but had no knowledge of mining and that the Associated Goldfields is being managed by a Toronto dentist. T. L. Tanton's paper, illustrated by slides showing a new vein near this property, followed. J. W. Evan's paper briefly described deposits or iron, gold, silver, galena, pyrites, molybdenite, mica, marble, quartzite, traprock, corundum, and actinolite. The pyrites deposits are the purest on the continent. The mica mine in eastern Ontario is also the largest of its kind on the continent. It is operated by the General Electric Co. Southeastern Ontario needs and deserves greater commercial development. This finished the presentation of papers.

At the banquet in the evening, speeches were made by Harry Mills, Minister of Mines of Ontario; E. P. Mathewson, Bradley Stoughton, and others. The dinner was punctuated by singing and college yells, including a barnyard yell invented by E. A. Collins. A high time was enjoyed by all, but nobody was arrested, according to the latest midnight bulletins.

Airplanes for Granby

A dispatch to the New York newspapers, from Vancouver, under date of March 10, is as follows:

Airplanes Will Transport Ore

Vancouver, B. C., March 10.—Four airplanes are to be used this summer in carrying ore from mines of the Granby Mining Co. twelve miles to tidewater at Stewart, B. C., it was announced today. Each plane will carry 1,000 lb. of ore a trip. Freight charges, it is estimated, will be reduced 50 per cent by airplane transportation.

Canadian Mining Engineer—His Status

By James McEvoy

ENGINEERS and technical professional organizations in Canada have accorded a good deal of attention to the status of the engineer for the last twenty years or more, and during the last two or three years that attention has increased in geometrical progression. As the subject has been selected for discussion at the meeting, it is desirable to have a brief summary of what has been done up to this date, so that those taking part in the discussion may get off at an even start.

During the early years in the lifetime of this Canadian Mining Institute, efforts were made in some of the provinces to have legislation passed regulating the practice of engineering of all kinds, civil, mining and other, but representation made to the legislatures by the members of the Mining Institute succeeded either in having the bills withdrawn, or in having mining operations omitted from the list of engineering work coming under the provisions of the acts. In 1898 an act was passed in Quebec regulating engineering work, and the clause which determines the scope of the law reads as follows: "The expression 'civil engineer' means anyone who acts or practices as an engineer in advising on, in making measurements for, or in laying out, designing or supervising the construction of railways, metallic bridges, wooden bridges, the cost of which exceeds $600; public buildings requiring engineering knowledge and experience, roads, canals, harbors, river improvements, lighthouses and hydraulic, municipal electrical, mechanical or other engineering works, not including government colonization roads or ordinary roads in municipalities, but does not apply to mere skilled artisan or workman."

The terms of the law provided that no one except a member of the Canadian Society of Civil Engineers could act as engineer in any work coming under the above definition, and this act has been amended this year, making the provision apply to anyone not a member of a corporation of engineers. Control of this corporation is vested entirely in the members through their elected representatives.

It is of interest to note that no mention is made of mining engineering, so that the mining profession is not affected unless an attempt should be made to have the general clause "or other engineering works" embrace mining operations. The act practically creates a close corporation, but the terms of the definition of an engineer are loose, and as far as I can learn the law is not enforced.

We have members from the Western provinces here who can tell us of the legislation there. Manitoba has passed an act which I believe does apply to mining engineers, but I have been disappointed in not getting a copy of it in time for this meeting. Similar legislation is pending in other provinces, both east and west.

A little over a year ago the Engineering Institute of Canada called a committee together in Montreal, consisting of a representative from each of the provinces in the Dominion, to prepare a bill which might be used as a basis of legislation in all of the provinces, and thus secure some degree of uniformity. This committee had many consecutive sessions and reported with a model act, which was printed in the committee's Journal.

This bill has been discussed by individual members of the Canadian Mining Institute, and some of the branches have passed resolutions of objections to some of its provisions. As yet, however, this Institute as a whole has not decided on any policy in the matter, nor has it, as far as the ordinary member knows, even considered it.

The problem of devising suitable legislation is one which gives rise to very decided opinions, differing one from the other, to the extreme of being diametrically opposed. It is not a problem concerning Ontario alone, but is of importance to the entire dominion, and it is also today a live question in England and the United States.

A careful and analytical report on a study of professional organizations in England has been made recently by Sydney and Beatrice Webb, which was printed in the *Engineering News-Record*. It shows a wide range of difference for the several professions, varying all the way from a typical trades-union organization to the type which practically considers only the ethical side of the profession.

There are a few facts which apply generally to the problem of legislation for engineers, no matter what particular branch of engineering we have in mind; for example: Engineers can be divided into two classes, viz., employing engineers and employed engineers, and the views of these two classes are not likely to coincide.

And again, in all professional organizations we have a group of the older members, and a group of the newer or rank-and-file members. The boundary between these two groups may not be clearly marked, but the groups exist with the boundary at some point between them. Administration of the affairs of the organizations is generally in the hands of the older members, or perhaps it would be better to say in the hands of those standing high in the profession. Hence there is a more or less articulate demand from the rank and file for reform, for something which will make a change, and they are inclined to view with suspicion proposed legislation, because they fear it may be favoring the men at the head of the profession.

On the other hand, it is contended that practically all recently proposed legislation would be of direct benefit to the rank and file, and of no particular benefit to the men at the head, except in so far as it might elevate the standing of the profession as a whole.

There is a tendency in all professional organizations to develop groups having special interests, and, when this grouping reaches a certain stage, to split up into separate organizations. Unless the parent organization is of a sufficient size to stand this, the result is likely to be the disintegration of the main body.

Now, what is the main objective of legislation for the engineer; is it to be made for the benefit of the members of the profession, or is it to be for the benefit of the community—in other words, is it to be for self-interest or for service? There may be some who hold that it is not practicable to aim at altruistic ideals,

*Abstract of a paper presented at the March, 1920, meeting of the Canadian Mining Institute.

but it may be worth their while to remember a very wise old saying which tells you that, having first attained what may here be said to be something of good to the community, then all these other things shall be added unto you. In other words, if an organization succeeds in passing an act which will be for the public weal, then that act will react to their own benefit. To put the matter in still other words, should our attitude be "what is there in it for me," or should it be "will this be of public service?"

I have endeavored so far to outline some points of view of the question without any personal bias, and now, if it be permissible, I will make a few suggestions which you may consider only my personal views:

First—It is yet an open question whether or not we need any legislation for mining engineers. However, we must bear in mind that if we do not legislate for ourselves, somebody else will legislate for us, unless we are perpetually armed against outside interference.

Second—That legislation which may be suitable for other branches of engineering may not, in fact is not, at all likely to satisfy the needs of the mining profession, or the mining industry. Special provision for the government of mining engineers is essential, whether this be afforded by special clauses in one all-embracing law or by means of a separate ancillary statute.

Third—There is grave danger to the mining industry if legislation of too exclusive a character is enacted. It ought to be freely admitted that the owner of a property can engage any one he likes to tell him what he thinks of it, and how it should be worked. If the foreign capitalist cannot freely send his own man, in whose judgment he has confidence, to advise him about investment, then without doubt the development of our resources will suffer.

Fourth—That not only for the good to the public, but also for the welfare of the members of the profession itself, it is not desirable to have the profession a close corporation. This may appear to be a debatable point, but, while I am open to conviction, it is the opinion I now hold after a good deal of thought on the subject.

Fifth—That the administration or government of the profession should be carried out with the assistance and advice of members of good standing.

Sixth—It is very doubtful whether in any legislative act there is a satisfactory definition of what work is legally termed mining engineering.

The application of science to industry is constantly progressing, and a correct definition today will likely be obsolete in a few years. It might be better to leave the decision as to what constitutes mining engineering to a board of professional men.

Cleaning Converter Slag at Anaconda

The Anaconda reverberatory furnace for cleaning converter slag has been very successful, according to Frederick Laist and H. J. Maguire, who prepared a paper on the subject for the February meeting of the A. I. M. E. in New York. The furnace is unusually large, being 153 ft. long and 23 ft. 4 in. wide, with a flue area of 51 sq.ft. It is fired by powdered coal.

The charge to the furnace consists of about 54 per cent of molten converter slag, 38 per cent of calcines, 6 per cent of concentrates and 2 per cent of tailings. The total daily charge is about 1,000 tons, which requires about seventy-nine tons of coal. The ratio of cold charge to coal is 5.8 to 1. The slag loss withall but young codfish or something. the above charge averaged 0.55 per cent copper, the matte produced being about 40 per cent.

The furnace was shut down in February, 1919, after a run of 409 days since a general repair was made. The roof and part of the side walls were re-bricked for a distance of 42 ft. from the coal burners; the roof, for a distance of 15 ft., was also rebuilt.

February Mining Dividends

Mining dividends paid in February, 1920, by eleven United States mining and metallurgical companies amounted to $3,870,859, as compared with $8,088,946 in February, 1919, paid by eighteen companies. Canadian or Mexican companies disbursed $366,000 in February, 1920, as compared with $1,568,500 in February, 1919. Details of February, 1920, dividends appear in the following table:

U. S. Mining and Metallurgical Companies	Situation	Per Share	Totals
Am. Zinc, Lead & Sm., pfd	U. S.	$1.50	$120,810
Anaconda, c., s.z	Mont.	1.00	2,331,250
Ariz. Silver Mines	Nev.	.03	13,500
Central Eureka, g	Cal.	.05	19,631
Chief Consol, s.g.l	Utah	.10	88,422
Fanny Rawlings, g	Col.	.005	5,000
Internat. Nickel, pf	U. S.-Can.	1.50	133,689
Miami Copper	Ariz.	.50	373,557
Mohawk Mining, c	Mich.	1.50	150,000
Quincy Mining, c	Mich.	1.00	110,000
United Verde Exten., c	Ariz.	.50	525,000
Canadian and Mexican Mining Companies			
Amparo Mining, g.s	Mex.	$0.05	100,000
Coniagas Mines, Ltd., s	Ont.	.025	20,000
Hollinger Cons. Gold	Ont.	.05	246,000

Two holding companies reported payments in February, viz. the General Development Co., 61 Broadway, of 50c. per share, amounting to $60,000, and the White Knob Copper & Development Co., of California, 5c. per share, amounting to $10,000. It is of interest to note that the Fanny Rawlings Co. has resumed dividends, after suspension since 1908.

St. Joseph Lead Co.

The report of the St. Joseph Lead Co. for the year ended Dec. 31, 1919, states that the company, after running at reduced output throughout the year 1919, was encouraged to return to full production in January by a strong and healthy demand for its products. The company's mines produced 1,978,922 tons of ore, and its mills produced 114,449 tons of lead concentrates. The smelter was shut down for repairs in February, 1919, and did not resume operations until October, 1919. During that period the current output of the company's mills was smelted on toll at the neighboring smelters of Collinsville and Federal. In the year 1919 dividends to the amount of $1,550,478.60 were paid to shareholders.

February Pig-Iron Production

Coke and anthracite pig iron production during February totaled 2,978,879 tons, or an average of 102,720 tons per day, according to *Iron Age*. This production shows an increase over the daily average during January, which amounted to 97,264 tons, or a total of 97,264 tons.

Among highly specialized enterprises noted is the Sardine Tin Mine in Australia, operated by the Sardine Option Syndicate, Ewan, Kangaroo Hills field. Probably the option offered by the syndicate refers to a choice between the domestic and the imported kind. Personally we find the imported kind much superior to the domestic, which we imagine are not sardines at

Hennen Jennings

HENNEN JENNINGS, who died in Washington on March 5, was a mining engineer. He was a big man in intellect, but more so in wholesome character and the elements which have contributed so much to mark a considerable group of able and successful engineers who have enriched the annals of mining engineering in America and in foreign countries as well; for few engineers of Mr. Jennings' time there were who did not receive recognition from important mining companies abroad.

Jennings was born at Hawesville, Ky., in 1854. His mother, a woman of rare culture, was his first teacher and provided the inspiration which made him the man he was and continued to be through life. His father was interested in coal mining, and this no doubt was an important factor in influencing him to follow the career of mining engineer. In 1877, he was graduated in

HENNEN JENNINGS

civil engineering from the Lawrence Scientific School, Harvard University. Prof. N. S. Shaler was one of his early instructors and helped Jennings to lay the beginning of a broad and liberal education. With the students and the distinguished men of the 70's, of which there was an important nucleus at Harvard, he made many friends. His first mining work was as an accountant at the North Bloomfield mine, in California, a famous hydraulic mine of that period. He then went to the New Almaden quicksilver mines, beginning with a salary of $50 per month. While there he became acquainted with Ross E. Browne, and, as a surveyor, made his first real progress in mining. He afterward became superintendent and came in touch with Prof. S. B. Christy, Fred W. Bradley, Charles Butters, and George F. Becker. Jennings was fortunate in his friends.

In 1886 Jennings married Miss Mary L. Coleman, and the year after left New Almaden to take charge, as manager, of the El Callao mine, in Venezuela. Two years later he left and went to South Africa, by way of London, as consulting engineer for the H. Eckstein group of mines. He was in this important position for ten years and then became consulting engineer for Wernher, Beit & Co., remaining with this firm until 1905. During this time he was consulting engineer for the Robinson, Ferreira, Crown Reef, New Heriot, City and Suburban, Village Main Reef, New Modderfontein, and other mines on the Rand. His early training in gold mining in California was most fortunate, for the Rand was a gold camp. Upon his advice Charles Butters was engaged, and the first chlorination plant in South Africa was put in operation there. At about the same time James A. MacArthur, J. H. Cordner-James, and Alfred James came to the Rand with the MacArthur-Forrest cyanide process. Jennings' firm finally entered into an arrangement with the patentees, and the first cyanide plant for the treatment of tailings was constructed at the Robinson mine after the designs of Alfred James and MacArthur. Subsequently, a larger plant after the designs of Charles Butters was erected. In the early and mid-period development of the Rand, Jennings took a leading part. It is of interest to note that he was the first president of the South African Association of Engineers and Architects, which shows the high esteem in which he was held by his associates, who numbered many occupying high positions in the mining fraternity of the Rand.

After returning to America Jennings became consulting engineer for the Conrey Placer Mining Co., operating gold dredges at Ruby, Mont. The breadth of his interests is indicated by the fact that he took the chairmanship of the sections of Mining, Metallurgy, Economic Geology and Applied Chemistry of the Pan-American Scientific Congress—and aided in the interchange of fundamental thought in those subjects. In 1912, he was councilor and from 1915-19, one of the directors of the American Institute of Mining and Metallurgical Engineers, of which he had been an active member since 1884. He was also a member of the Mining and Metallurgical Society of America.

During the war Mr. Jennings was attached to the Bureau of Mines as voluntary consulting engineer. He was chairman of the committee appointed by Secretary Lane to study the gold situation, the other members of the committee being from the Bureau of Mines and the Geological Survey. A thorough investigation was conducted, and an exhaustive report made to the Secretary, which was printed and used by a general committee afterward appointed by the President to study the same problem. Mr. Jennings was also in charge of the platinum committee of the War Industries Board, which handled the platinum emergency. He was also an associate member of the Committee of Mineral Imports to the Shipping Board.

In a delightful résumé of Mr. Jennings' career, by T. A. Rickard, the following paragraph, which is taken therefrom, gives a clean-cut insight into the worth of the man: "I remember very well what Hamilton Smith said to me at the New Almaden mine when I was offered a salary of only $50 per month without board. He said: 'Do not mind this salary, Hennen; do not think of your salary, but of your work, and one of these days you will be paid more than you are worth.' Whatever success I have had has not been due to the possession of any particularly brilliant brain, but to hard work with interest in it, and to the kindly contact with men about me, and in obtaining their assistance in the work I was directing."

CONSULTATION

The Pas District, Manitoba

"Am taking the liberty of writing you and asking for information in regard to the new mining district called 'The Pas District', Manitoba. I see by literature from there that the Tonopah Mining Co. took charge of the Mandy mine. I thought perhaps you could give me some information in regard to work, prospecting and what chances a man would have in general if he went up in that section. Any information, or the name of anyone to whom I could write up there, certainly would be appreciated."

There are excellent chances for the discovery of ore deposits of value in the great unexplored region to the north and northwest of The Pas, but we cannot recommend that you go there unless you have a certain amount of capital which you are willing to spend on an expedition, with the strong probability of not getting anything to show for it.

The district has been gone over by many prospectors, and so far only two deposits of value have been discovered—the Flin Flon mine, which was located by six veteran prospectors, and the Mandy mine, which was discovered by a party of engineers accompanying J. E. Spurr on his expedition to look over the deposits of the district. The oxidized material of this deposit was noted on the shore of Schist Lake by this party, consisting of Spurr, Haynes, Bancroft, Jackson, and Reynolds. It was arranged that Jackson and Reynolds should return after camp was made for the night and investigate, and the actual location was made by these engineers. The property was immediately taken over by Spurr for the Tonopah Mining Co. This is the only mine which has been worked in the district, having produced several million dollars' worth of high-grade copper ore. The Flin Flon mine is a large low-grade deposit which has been optioned and examined several times, but is still seeking capital.

If you wish to write to Mr. George Bancroft, at The Pas, he will doubtless be glad to give you recent information.

Amalgamation of Tarnished Gold And Flour Gold

"Knowing that you are acquainted with the mining and milling machinery business, I should be pleased to receive some data about amalgamation.

"I have two plants treating gold and silver ores, but the plates that I use are not giving good results. The very fine or 'flour' gold in the slimes is carried over the plates on top of the water and lost; also, the coarse, tarnished, or 'rusty' gold is not saved on the plates.

"If you will be kind enough to give me the names and addresses of some firms that make special machinery for amalgamation, I shall be very much pleased."

The two conditions which you describe require different methods of treatment for overcoming the difficulty. Ordinarily, tarnished gold requires a certain amount of abrasion before the surface of the gold particles are sufficiently clean to adhere to the amalgamated surface of the plates. At Silver City, Nev., shallow grinding pans were used, through which the pulp passed after leaving the plates. Mercury was used in the pans, and the pulp overflowed at a lip, whence it passed to Wilfley tables. You might get one of the old silver amalgamating pans, and cut the side walls down to about a foot or eighteen inches high, and arrange an overflow lip or spout on the side. The inflowing pulp should be passed into a collar surrounding the stem of the muller, so as to drive any float gold under the surface of the pulp.

Flour gold, or float gold, has always been troublesome, and at least two methods suggest themselves as being worth trying. One suggestion is the use of an amalgamator such as the Pierce, and the other is flotation, using a simple machine like the Minerals Separation, Ruth, or K. & K. The Pierce amalgamator has been in use for a long time, and is considered favorably by millmen. It is a simple device, and causes the pulp to be submerged against a series of amalgamating plates in such a way as to bring much of the gold against an amalgamated surface. It is manufactured by the Mine & Smelter Supply Co. of Denver, Col. We refer you to the advertising pages of *Engineering and Mining Journal* for the business addresses of manufacturers of flotation machines.

You will realize that we can make only general suggestions, as your letter does not give us sufficient information regarding the method you are now using. It is possible that you could increase your recovery by changing certain details and practice in your present method of treatment.

Metallurgy of Vanadium and Molybdenum

"I am looking for a process to extract molybdenum from wulfenite, and vanadium from vanadinite, either separate or when these two rare metals occur in the same ore. I understand several articles have been written on this subject in your very interesting publication. I know of three as follows: 1911, Vol. XCI, p. 1,248; 1913, Vol. XCVI, p. 1,103; 1920, Vol. CIX, pp. 212, 216. No doubt several other articles have been published, and you may perhaps direct me in this respect."

The three articles which you mention have little to say about the metallurgical process involved. Some recently published papers taking up the metallurgy of vanadium include: Bulletin 18 of the Arizona State Bureau of Mines, Tucson, Ariz., 1915-16; *Chemical and Metallurgical Engineering*, New York, May 1 and 15, 1919; U. S. Patent No. 1,223,567, April 24, 1917, obtainable for 10c. from the Patent Office, Washington, D. C.; and the *Mining and Scientific Press*, San Francisco, Sept. 9, 1916. References to molybdenum are more common. See the Twenty-sixth Annual Report of the Ontario Bureau of Mines, Toronto; Bulletin 111 of the U. S. Bureau of Mines; Bulletin 5 of the University of Arizona, Phœnix; Transactions of the Canadian Mining Institute, Montreal, March, 1917; Transactions Royal Canadian Institute, November, 1917; and the *Salt Lake Mining Review*, Nov. 30, 1917. The ores of these metals are treated on a rather small scale, and but few details of treatment, particularly in the case of vanadium, have been made public.

THE PETROLEUM INDUSTRY

The McKeesport Gas Pool

A RICH mineral discovery, be it oil, gas, gold, or silver, has the inevitable result of starting individuals in the near locality into their digging clothes, in the hope that another discovery can be made. There is often feverish haste to get in, and under such circumstances money is frequently lavishly and, in many instances, unwisely spent. Leases are taken up, ground is acquired by purchase, companies are formed, and stock is sold for the purpose of providing money for continuing the work. This is a good thing for the mineral industry, for without it, or some similar procedure, mining would languish.

Were it not that the occasion becomes the opportunity for men of insincere if not dishonest purpose to go with the crowd of pioneers, there would be little to find fault with in the situation. Close on the heels of the worthy, and intermixed with them, flock a school of sharks who endeavor to capitalize on the activity and the interest as well as on the weaknesses of the public. It is difficult to draw the line, or, for that part of the public excited by the stories of new-found wealth, to discriminate between the projects that are promising, those which are highly speculative, and those which are fraudulent.

Whether any machinery will ever be devised adequate to cope with this situation is a matter of doubt. Under such circumstances, when we find a public official taking an active stand, and endeavoring to the best of his ability to give to the intending investor accurate information on the intrinsic difficulties, and to warn him of the existing pitfalls, we are inclined to applaud. A case in point has arisen at McKeesport, Pa. Dr. George H. Ashley, State Geologist of Pennsylvania, has issued general warning against injudicious investment in the many new companies which have been formed on the discovery of what has been said to be the "best-paying gas well in the world." The well in question is said to have delivered an average of fifty million cubic feet of gas per day for 100 days, all of which has been marketed to great advantage, as the well is in the heart of the Pittsburgh district, where natural gas is in demand.

Dr. Ashley says, in his report, that by December of last year no less than 116 companies or corporations had been formed, and 239 proposed wells located. "Jan. 10, the number of campanies had increased to 297, including fourteen new concerns granted permits to issue stock on that day, notwithstanding the advice given by the office of the State Geologist through the papers last December that investments now being made for future drilling are almost certain to result in partial if not total losses."

Dr. Ashley's subsequent report, issued Jan. 12, is a detailed résumé of available information on the possibilities and uncertainties attendant upon excessive drilling in the gas field contiguous to McKeesport. It should be in the hands of every investor and every intending investor interested in this region. In issuing the report, which we consider a conservative one, Dr. Ashley has done only what would be expected of a public official occupying an office of this kind. Nevertheless, his report does not please everyone, and a movement is on foot among certain citizens of McKeesport to question the report. According to newspaper accounts, at a recent gathering of about 300 men, directly or indirectly connected with the gas-field promotion about McKeesport, a committee was appointed to make inquiry into the situation. Such a committee can do splendid work if it will make a comprehensive survey of the ramifications of the "promotion activities" consequent upon the discovery of "the best-paying gas well in the world."

We would like to see a clean-cut tabulation of the companies formed, capital stock issued to promoter and his friends; the increment between land owners and lessee, and between lessee and company; the amount of stock sold to the public; money spent in salaries and office expenses; money spent in equipment and supplies; and money spent in drilling operations. A tabulation of the results by completed wells should accompany the foregoing. We feel that, after reviewing the assembled information, the committee would be somewhat surprised.

It is almost too much to hope that this committee will do what we have suggested. In any event, it can advance the interest of honest enterprise by giving full publicity to the operations of the companies seeking to exploit gas wells in the McKeesport region.

Petroleum Engineering Work in Wyoming*

Bureau of Mines and Rocky Mountain Petroleum Association Join To Better Conditions in Oil Fields—Example of Successful Well Cementing

THE problem outlined below, illustrative of the work of petroleum engineering, was carried on by members of the Bureau of Mines in co-operation with the Rocky Mountain Petroleum Association, an organization which was formed for the purpose of raising a fund which was to be placed at the disposal of members of the Bureau of Mines for giving assistance and advice in regard to drilling wells in the Wyoming oil fields. Before such an organization was formed, preliminary examination showed that operations on Government lands were resulting in considerable waste in both oil and gas production. It was therefore desirable to take steps toward establishing an organization which would render aid and assistance in overcoming such conditions. Accordingly, the Midwest Refining Co., the Ohio Oil Co., and the Continental Oil Co. voluntarily placed at the disposal of the Bureau of Mines a sum of $30,000 to carry on remedial repair work. That this work, within six months' time, has already yielded beneficial results, can readily be seen from the following example:

*From "Monthly Reports of Investigations," U. S. Bureau of Mines, January, 1920.

On Aug. 17, 1919, F. B. Tough and B. H. Scott visited the Lance Creek field and interviewed Tom Armstrong, superintendent for the Buck Creek Oil Co., with regard to the advisability of cementing off the water in the Buck Creek well No. 4, Sec. 26, T. 36 N., R. 65 W. Mr. Armstrong decided to turn this well over to them to take such steps as they might think needful to repair it and bring it back to production. Accordingly, Mr. Armstrong was asked to prepare the well for cementing, and on Sept. 16, 1919, the well was turned over for the work. At this time the well was in the following condition: Depth, 3,672 ft.; casing, 6¼ in., frozen at 3,670 ft.; formation at 3,670 ft., sandy shale. There was 2,500 ft. of water in the hole, which could not be baled down. Mr. Armstrong stated that the well was only a few feet above the second oil sand and that it would be dangerous to drill any new hole.

After trying to work the 6¼-in. casing loose, it was decided to cement a 4¼-in liner in the bottom of the hole as a last resort. With this point in view, the driller was asked to clean the hole to bottom and drill two feet further into the shale, in order to give a 4-ft. wall for the cement. As the well was caving badly, it was necessary to dump mud into it with a latch jack bailer before any progress could be made. After the well had been properly mudded, and the hole deepened to 3,674 ft., a 4¼-in. liner was made up 46 ft. long, with a belled nipple in the top and a short "bullet-nosed" wooden plug driven into the lower end. The collar near the upper end had a hole drilled through it for a ⅞-in. pin, which was used to hang the liner on the lower rein of the drilling jars. Above the jars was placed a 6¼-in. "sub," with a beveled shoulder on the lower end. This "sub" acted as a "driving mandrel" to place the liner firmly on bottom. Above the "sub" was placed a regular drilling stem for 6¼-in. hole. Three sacks of Santa Cruz oil well cement were then thoroughly mixed and placed on the bottom of the well, with a latch jack dump bailer. The amount of cement to be used was computed so as to fill up outside the liner and cover the water and sand and cement the liner into the 6¼-in. casing.

The liner was then put in place with the drilling tools, and the hole filled up to the top with water, to eliminate all gas movement. The above operation was completed Sept. 23, 1919, and the well was allowed to stand undisturbed until Oct. 24, 1919. On that date the well was bailed dry and let stand until Oct. 28, 1919, when the bailer showed the hole to be dry.

The hole was then filled up to 2,500 ft. with water, to equalize the pressure inside and outside the casing while drilling the plug out of the liner. It might be added in this respect that it had not been customary to fill a hole with water when drilling through the oil sands. The usual practice was to drill in dry and allow the well to blow when the pay sand was struck. This had caused considerable loss in time and production in former operations and resulted in a few unsuccessful attempts at finally getting the well under control again. The reason for this practice was that it was thought that the true value of the oil sand encountered could not be successfully determined with that amount of water in the hole. However, with the hole filled with water as outlined above, the plug was drilled out and the hole drilled to 3,687 ft., a sample of the formation being taken at 1-ft. intervals in order to determine accurately the character and richness of the oil sand encountered. At this point the well was bailed down and the sands were tested dry.

After the water was bailed out the hole filled up 700 ft. with oil, but failed to flow. It was then drilled a little deeper into the sand, testing each foot, as had been done up to this time. After passing through 5 ft. of sandy shale (3,689 to 3,694), a rich oil-bearing sand was uncovered, and at 3,697 ft. the well started flowing, its initial flow Nov. 14, 1919, being 700 bbl. of oil, from 4 p.m. to 7 a.m.

The total production from Nov. 15 to 28 was 10,505 bbl., which, at the price of oil in that field at that time, $1.85 per bbl, amounts to $19,434. It is therefore evident that for one month the total production of this well alone would more than cover the total cost of the work carried on in the Rocky Mountain district for one year.

Spun Glass as a Filtering Medium

BY GEORGE A. LAIRD

In the Gulf Coast oil fields much trouble is experienced with the working barrels being cut to pieces by sharp and exceedingly fine sand, to say nothing of the annoyances caused by the tubing becoming filled to such an extent as entirely to block the rods.

Experiments have demonstrated the value of spun glass as a filtering medium. A strainer was made of pipe of two different sizes, the space between having been loosely packed with glass, and B. S. (brown settlings) and sludges from the Bayonne plant of the Standard Oil Co. used as a test. The finest particles of foreign matter were filtered out, the process also increasing the most minute water globules to the size of a pea, making dehydration much more readily accomplished.

Glass is non-corrosive, its hardness approaches that of sand, and even the finest threads are of sufficient strength to span half-inch openings in a strainer. It can be easily cleaned with gasoline. During the experiments with this strainer, which showed the tendency of the glass to enlarge water globules, another apparatus was tried. A two-inch glass tube was filled with one-eighth inch glass rods running longitudinally, and the B. S. was pumped through from end to end. Microscopic water globules were found to increase in size to "slugs" of a teaspoonful, due to the difference in viscosity of the two liquids. It remains only to initiate experiments under working-scale conditions to demonstrate the commercial application of the invention.

What Is a Royalty Unit?

Practically since the inception of the oil industry, the owner of prospective oil lands has negotiated leases on the basis of a cash bonus and one-eighth of all the oil produced, according to a bulletin issued by Wilson, Lackey & Co. This one-eighth of all the oil produced is called a royalty, and a subdivision of this royalty is called a unit or share. Of course, those seeking oil retain only seven-eighths and stand all the expenses to drill. Should the owner desire to dispose of his eighth, in the case of producing properties, he usually has many investors and speculators seeking him. The price the royalty owner receives is governed by the productivity of the land, together with its location in relation to big producing wells, or so-called gusher production.

Oil Wildcatting in Nevada

No Discoveries of Importance Yet Made in That State, but Considerable Work Being Done in The More Promising Districts—Shale Deposits Likely To Prove of Value, Even If No Oil Sands Are Found

Written exclusively for *Engineering and Mining Journal*

THE oil possibilities of Nevada—both from wells and from oil shale—are being tested in a number of prospective fields, and within a year some definite information on the subject should be obtained. Various enginers, geologists, and "oil experts" have examined and reported on different areas, and, as usual, a wide range of opinions is expressed as to the probability or certainty of finding petroleum in commercial quantities. Some have gone on record as saying that oil will surely be found in wells now drilling in Nevada; others report that geological conditions point to a reasonable belief that petroleum will be found at depths which will make its production profitable; and still another opinion is that the writer "could not conceive of more unfavorable conditions for finding oil" than existed in the area which he examined.

It has been pointed out by those who express unbounded faith in the oil possibilities of certain areas in the state that some of the most prolific fields in the country were originally condemned by "all the experts," and enough truth is in the assertion to warrant the unprejudiced man in giving at least his best wishes to those who are honestly endeavoring to prove their faith by drilling deep test wells. Such test wells are now being drilled in the Fallon field, in Churchill County, about fifty miles east of Reno, and in the Illipah Basin, in White Pine County, in the eastern part of the state. Also, drilling will probably soon be under way in the Fish Lake Valley, west of Goldfield; near Currant Creek, in White Pine County; in Coal Valley, forty miles south of Yerington; near Sulphur, on the Western Pacific, in Humboldt County; and in Dixie Valley, near the town of Elko.

The first well which was drilled in Nevada for the sole purpose of developing oil was put down a short distance west of Reno about thirteen years ago. Dr. Tibbetts, at one time connected with the Grant smelter, in Denver, was back of this venture and had confidence in its success. Lack of money, however, prevented the completion of the well, and work on it has never been resumed.

A few months ago the Fallon field began to attract attention, it being claimed that oil in small quantities was present in several wells that had been drilled for water, and soon the excitement increased to considerable proportions. A number of traveling salesmen who make Nevada decided they wanted to get their feet wet in oil, obtained control of some land, formed a company and started to sell stock. It was the psychological moment apparently, and they were good salesmen. In a short time there was a respectable treasury, and a standard drilling rig was bought. When the site for the well was to be spotted it was realized that that was a job for an experienced man, and a geologist of California was selected. Instead of spotting the well, the geologist made a report which caused the travelers to abandon the Fallon field, and they have since leased acreage in Texas.

The defection of the only company which was financially able to do much work had a depressing effect on the Fallon field for some time, but this was soon dissipated, and there is much more activity there today than at any previous time. Substantial people, and people who should know something of oil, have become interested, and the exaggerated reports of flowing wells and gushers are now less frequent than they were. At least two companies are drilling steadily and making fair progress; several other rigs have been ordered, and within a year it is likely that six or more tests will be under way.

In the Illipah Basin, in White Pine County, a well is being drilled and is now over 200 ft. deep. Difficulty in getting coal for fuel at Ely has retarded the work, but a carload has been secured, and better progress should be made. Drilling has not yet begun at Currant Creek, which is not far from the Illipah Basin, but it is expected that work will begin in the spring.

In Coal Valley, south of Yerington, the Navada Coal and Oil Co. announces that it intends to drill a well for oil, but at present it is confining its activities to the development of promising coal deposits. Just across a low range in the vicinity of Pine Grove, much prospective oil land has been staked, and a reputable engineer has passed favorably on this section.

Some years ago the Western Pacific drilled a well for water at Sulphur, in Humboldt County, which, it is claimed, showed the presence of oil. This section will soon be tested. Also, a rig may possibly be put to work a few miles south of Elko.

Whether or not oil in commercial quantities can be produced from wells in Nevada, it is confidently believed that oil and many valuable byproducts will soon be profitably produced from oil-shale deposits in the vicinity of Elko and elsewhere in the state. Two experimental plants have been established near Elko, and many thousands of dollars have been spent in making tests in the last few years. The fact that the U. S. Bureau of Mines, working in conjunction with the Southern Pacific Ry. Co., is back of one of these experimental plants gives the industry a standing that cannot be questioned. The second plant is owned by the Catlin Shale & Products Co., in which are one or more individuals having connections with the New Jersey Zinc Co.

Nearly four years ago Dr. Van. H. Manning, director of the U. S. Bureau of Mines, reached an agreement with Paul Shoup, vice-president of the Southern Pacific Ry. Co., regarding joint experiments for the treatment of oil-bearing shale, and much greater progress would doubtless have been made but for the war. The work up to this time has been under the supervision of Dr. David T. Day, who is looked upon as an authority on the subject. As many as fifty men have been employed at one time at the plant, which, however, is now closed for the winter. It is Dr. Manning's belief that a commercial plant should have a capacity of at least 1,000 tons per day.

The Petroleum Production Engineer*

Good Engineering Training Is Essential and Several Years Experience in Actual Field Work Is Highly Desirable

By A. W. Ambrose

MEN are needed in oil-field production work who correspond to the mining engineer of a large mining property. Some oil companies prefer to call an employee a resident geologist, resident engineer, or a petroleum technologist. He should perhaps be more correctly termed a petroleum production engineer. The duty of such a man is to apply his scientific and geologic training practically to oil-field development work.

The petroleum production engineer should be, by education, a mining, civil, or mechanical engineer, with a knowledge of geology and chemistry. Upon completion of his education, such a man should spend several years in the oil fields. There are two means of gaining proper experience. The first method is to work for an oil company in making a detailed study of each well, collecting data on the history and production, followed by a preparation of good records, from which well logs can be prepared. From the well logs, the geologic cross-sections, peg-models, and structure contour maps can be made. These allow a comparable, detailed study of each well, which is necessary to solve many of the problems. Along with this the engineer should visit drilling wells daily for collection of samples of formations and for a proper study of how they drill. He should form friendly relations with the drillers and production foremen. The second method of gaining proper experience is to start work as a roustabout, pumper, or on the pipeline gang, finally working up to a tool dresser. After three or four years of such work, the engineer may be classed as a petroleum production engineer.

It is unfortunate but true that often a strained relation exists between the technical and non-technical man. A fundamental purpose in the handling of a property is efficient operation, which cannot be effected best until this estrangement is ended. There is no reason why most cordial relations cannot be established between the driller and the engineer, provided a little leniency is shown on both sides. Each should realize that the other is a specialist in his own work. The engineer should appreciate that the records of conditions underground, as shown in well logs, histories, and other data, are largely the results of the driller's observation. He should discuss with the driller the practical application of engineering methods, so that the latter will take particular care to collect formation samples, fossils, or other data needed in solving the engineer's problems. The driller is most familiar with the formations, as he understands how they drill, so each day the engineer should discuss the daily well report with the drillers.

The duty of an engineer experienced in oil-field development is to direct the work[1] outlined below:

1. Keeping of records.
2. Preparation of data, such as production records, well logs, structure contour maps, cross-sections, etc., and other pertinent information.
3. Correlation of surface and underground geology.
4. Water problems.
5. Casing depths.
6. Underground losses.
7. Oil sands; location of productive sands, their thickness and quality of oil.
8. Well depths.
9. New well locations and extensions of the field.
10. Future well production.
11. Gaging of oil wells.
12. Perforations and setting screen pipe.
13. Fluid levels and tubing depths.
14. Shooting of oil wells.
15. Methods for extracting more oil from the oil-bearing formations.

At first his responsibilities will be limited until he has been able to work out the underground conditions on the property and to have his records, data, and other information compiled in such a form that they are readily accessible. As he becomes more experienced and proficient he will be able to take over more and more of the operating side, until he becomes a valuable adjunct to the management.

One of the most important duties in the oil fields is to collect the proper kind of data, and, in the case of those companies where records are incomplete and have not been properly kept, forms should be prepared immediately for the collection of desired information.

Importance of Production Records

The wells should be gaged daily, both for oil and for water. Exceedingly valuable information will thus be built up which will be worth its cost many times over during the life of the property. The water content will be useful in locating the source of water troubles. The production records will give valuable data as to the future worth of the property; also the effect the various methods of operation have on the production of individual wells and the property as a whole—for example, the application of vacuum pumping, the effect in shooting wells, the cleaning out of wells, and similar data; also in the later life of the property it will enable the producer to determine which wells are profitable and which are not, and many other important matters. By a study of production records the locations that will likely prove most productive can be chosen. This will take into account the condition of sands and the structure, in order to avoid tight parts of the sand or to avoid parts of the field that will be water-bearing, or, on the other hand, that might carry gas. Production records are also of value in estimating the future production of wells and of the property.

An important problem is to locate all water sands and proper casing depths. For this purpose, complete production records and all additional information possible in relation to the wells and their production should be collected. After location of the various water sands, any necessary recommendations should be made for the correction of wells making water. When the water sands have been definitely located, it is possible to choose the casing depths, well depths, and well locations, all selected to avoid water troubles. A knowledge of surface and sub-surface geology permits the selection of well locations that are best situated structurally, or in certain cases the selection of sites that will give definite or desired information as to the future of the field. Samples of the formations and samples of water should be collected. These may be labelled and stored away for examination if needed. This sampling involves only a small expense and may later prove helpful in the solution of problems that may arise. The engineer should interest the drillers in the collection of these samples and make use of their reports.

*From Monthly Reports of Investigations, U. S. Bureau of Mines, January, 1920. Abstract from article.

[1]These subjects have been discussed in detail by the writer in a Bureau of Mines bulletin No. 195, "Underground Conditions in Oil Fields," now in press.

NEWS FROM THE PETROLEUM INDUSTRY

California Oil Fields

January and February Operations Show Improvement Over Last Year

Oil field operations in California during the first two months of this year, according to the Department of Oil and Gas of the California State Mining Bureau, are of much greater volume than during a similar period in 1919. Indications are that the total output of oil will approximate that of last year. Should there be reported shortage of oil, or decrease in the amount in storage, it may reasonably be interpreted as an indication that the demands of consumers have increased. Selling campaigns of the past decade have been successful in establishing a demand, which can probably be met, but not exceeded.

The signing of the bill opening Government oil land to development under lease has aroused public interest in the possibilities of territory heretofore undeveloped. Interested persons without previous experience in the oil business would do well to approach the matter with caution before making extensive expenditure. The administration of the new law will be in the hands of the Secretary of Interior. Details of administration have not yet been worked out.

Practically all successful developments of new oil fields in California during recent years have resulted from preliminary examinations by geologists specially trained and experienced in petroleum work. The cost of drilling has greatly advanced in recent years, and prospect or "wildcat" wells should be started with financial provisions to meet a cost of from $50,000 to $100,000 per well.

Oil-field operations during the week ended Feb. 28, 1920, show 12 new wells started, the same number as last week. The total of new wells this year is 151, as compared with 97 at the same date last year. Tests for water shut-off this week numbered 18, as compared with 20 during the previous week. Yearly total to date 208; total to same date last year 201. Deepening or redrilling jobs this week numbered 12, as compared with 10 during the preceding week. Total to date this year 142; total to same date last year 152. Wells abandoned this week numbered 4, as compared with 6 during the preceding week. Total to date this year 48; total to same date last year 36.

Announcement is made by the Seep Purchasing Agency of an advance in price of Pennsylvania crude oil of 15c. per bbl. bringing the price to $5.90 per bbl. Independent refiners, it is reported, were still offering bonuses above the posted prices, but little oil is being sold, as producers are believed to be holding for better prices.

Independent Oil Operators Association

Annual Meeting and Exposition To Be Held in Denver in September

Plans are being made for an oil and oil shale exposition in connection with the annual meeting of the Independent Oil Operators' Association, which will convene in Denver, Col., Sept. 28, 29, 30, and Oct. 1. The association comprises the principal oil operators throughout the country. The convention and the exposition will be held simultaneously, but the latter will continue well into October.

It is proposed that the exposition comprise the greatest display of petroleum products, manufacturing equipment and oil-drilling appliances that has ever been brought together. Allied industries will also demonstrate the wide range to which petroleum products can be adapted. Oil shale will be given a prominent place in the exposition, and a demonstration will be made of the use of the latest appliances for extracting oil from shale.

Recent Wells Brought In in Montana

Bringing in of a well by the Roundup Oil and Gas Co. about a mile and half distant from the Van Duzen discovery well, in the Devil's basin, north of Roundup, Mont., is attracting attention to the oil possibilities in that state. Further interest was aroused by the bringing in of a well last week by the Franz Corporation operating in the Cat Creek basin, near Winnett, Mont. The oil from this third well is of a higher grade than that of either the Van Duzen or the Roundup wells, and compares favorably with the Wyoming product. The Van Duzen well is estimated to have a capacity of 360 bbl. daily as calculated from a five-hour pumping test. The Roundup well is believed to have a still greater capacity. In the case of both wells the sands have been penetrated less than two feet. The Franz well is flowing over the top, but no estimate as to its capacity is obtainable.

Arizona and New Mexico Notes

Gas is reported to have been struck at Bowie, Ariz., in the well of the U. S. Oil Refining Co., owned largely by Bisbee mining men. A pocket was struck at 800 ft. immediately below a hard shale. Work was stopped at once, and the fires under the boiler were drawn as a precaution. These will be removed to a safe distance. The Buffalo Oil and Gas Co. has unloaded a large Star oil rig at Lordsburg, N. M., and moved it to its well southwest of town. The well is now 165 ft. deep. The well of the Florida Oil Co., six miles northwest of Deming, N. M., is down 500 ft. in a hard lime formation.

Export Price Policy

Reply of the Standard Oil Co. to Criticisms of London Board of Trade

A general attack on prices of refinery products is of interest to producers. The recent report of the central committee of the London Board of Trade in which an export price, recommended as fair by this committee, would mean at prevailing rates of exchange 7c. per gal. for gasoline f.o.b., New York, is a case in point. The Standard Oil Co. of New Jersey in a statement said: "The soundness of this conclusion may be gaged by the fact that the cost of the various crudes when they reach the seaboard ranges from 40 to 100 per cent above the proposed selling price for gasoline." The statement goes on to say:

"With British exchange at $3.40 to the pound, a price of £23 sterling a ton means but slightly more than 21c. an American gallon. This quotation is for the product known as No. 1 petrol in Europe, or 64 deg. gravity gasoline in this country. As any refiner will testify, this is a low price for gasoline of this grade today. The Board of Trade investigators tell of one unnamed Eastern producing company which sells its petrol at £10½ a ton f.o.b. and makes a good profit on the transaction. This presumably is the Anglo-Persian Petroleum Company, Ltd., a producer of Persian crude in which the British government holds the controlling interest. This company, we understand, sells its gasoline in the United Kingdom through the Dutch-Shell group, which is maintaining the retail price of which the committee complains. If this is true, it would seem to be a simple and entirely internal situation for the British Government to adjust, by requiring the group selling the government gasoline to name retail prices more in accordance with the price realized by the government's producing company."

Test Well Started at Chloride, Ariz.

Interest is being shown, according to S. Ford Eaton, in the new Chloride-Kerwin oil and gas field situated on the Colorado River about thirty miles west of Chloride, Ariz. Surface indications are believed to be of a promising character, oil and gas seepages having been encountered at various places. The Colorado River Oil & Gas Co., a local organization, has installed a rig and is drilling a test well. Opinion has been expressed that if oil is found it will be at the comparatively shallow depth of from 1,000 to 1,500 ft. There is a well-defined anticlinal structure about a mile east of the river. The anticline parallels the main range of mountains.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Gold Flowing From the United States

Despite Huge Trade Balances in This Country's Favor, Exports of the Precious Metal Continue

The Guarantee Trust Co. of New York in a circular issued recently says in part:

The trade export excess of the United States for 1919 was 4 billion dollars—4.4 billions in our trade with Europe—following other huge export excesses in preceding years, especially since 1914-15. In spite of this, the precious metals, gold and silver, are flowing in a fairly steady stream from the country. During the year 1919 our net exports of the two metals were respectively 291 and 150 million dollars. The domestic credit stringency has been reflected in declining reserve ratios at the Federal Reserve Banks.

In the light of these conditions a certain alarm is felt at the continued export of gold. A gold dollar in the vaults of a Federal Reserve Bank serves, or may serve, as the basis of deposit liabilities of $2.50, and these deposits, to the credit of a member bank, may in turn serve to enable credit extension by that bank of anywhere from seven and a half to fourteen times that amount, or say $19 to $35. With reserves close to the legal minimum, therefore, every million dollars of gold lost practically means forced credit contraction of perhaps twenty millions, unless contraction comes about by normal industrial liquidation.

Meanwhile, it is further pointed out that gold production in this country, now at its lowest figure since 1896 or 1897—between 55 and 60 million dollars in 1919, as against 105 millions in 1915—is not adding to our stock available for banking reserves, as industrial consumption of the yellow metal is at a greater rate than new production.

The gold has been going mainly to the Orient or to South America—to nations which are essentially providers of raw materials for the remainder of the world. Trade balances with these countries during 1919 showed a considerable excess of imports into the United States over our exports to them. When the gold embargo was lifted in 1919, it naturally became profitable to ship gold and settle debts.

A few words are in order as to currency and banking conditions in China and India. China is a "hard-money" country, with enormous powers of absorbing the precious metals among its 400 millions of inhabitants. In India, in 1898, the Imperial Government set up a gold exchange standard with 15 silver rupees the equivalent of a pound sterling. The hand-to-hand currency of the country, aside from base-metal coins, for all practical purposes consists of silver rupees and government notes, the latter issued with a backing of silver and gold held in London, and Indian and British Government "securities." In other words, part of the issue is fiduciary, or pure credit money.

The greater part of the world's production of new gold takes place within the limits of the British Empire, and a large proportion of this new gold from British sources is being offered for sale in London and bought up by the Indian Government, at prices which lately have been around 125 shillings an ounce. The price, of course, can never go far above that figure, which, converted into dollars at the current rate of exchange, will be the equivalent of $20.67 an ounce, so long as New York is a free gold market. The Bank of England is just at this time gathering into its vaults all possible gold, letting none of it go out.

It has been estimated that in the last half century, India alone has absorbed from 1¼ to 1½ billion dollars worth of gold. The amount taken by India and China in the near future—that is, in the next few years—will depend on a number of factors, of which the trade balances of these countries form but one.

There is at the present time the greatest mobilization of gold in the hands of the central banks and national treasuries in the history of the world. At the same time, the huge issues of paper money in most of the important countries of the world, former neutrals as well as belligerents, have caused currencies to be highly diluted, and the metallic reserves in many cases are all too small for the amount of paper currency and of credit that have been created. Neither is the gold spread at all evenly, so that the Central Powers and the new nations that have just been created out of the German, Austrian and Russian empires are beginning their post-bellum existences under precarious financial and fiscal conditions. England even is hoarding her gold, as we have seen, while at the same time recent statistics show that she is unquestionably making progress in reducing her fiduciary paper currency. France, Belgium, Italy, with larger paper issues than Britain, especially relatively, can still less afford to part with gold. The European neutrals are not disposed to decrease their holdings, at least to send to the Orient.

Meanwhile, the world's gold production, due to high prices and, therefore, high money costs of mining, has sunk to the lowest level in fifteen years. Silver production has not, so far, responded to the high prices for the metal established in the last two years. Consumption in the arts has been running at a heavy figure for both metals. The possibilities for an increase in the world's new gold are too remote to make much difference. More hope can be placed in the greater production of silver, which, in so far as silver could be shipped to settle debts to the East, would take some of the burden off gold.

Where, then, shall the gold come from, to satisfy Eastern demands, as it is evident that the new gold production is not at present of sufficiently large proportions, after deduction is made for gold used in the arts? Shall it come almost solely from the stock in our Federal Reserve Banks—which has just fallen to the lowest figure since the summer of 1918—and from the United States Treasury, in redemption of gold certificates? Can we afford to lose gold in undeterminable amounts while Europe seems disinclined to part with its gold reserves?

The arguments for restrictions on exports of gold from this country are on two grounds, one domestic, the other international. The first is that this country should have deflation under direction and control. The second is that gold will do more good in the new European countries than in the East, where it will largely go to increase native hoards.

The proposal comes to limit shipments to virgin gold. The export of gold manufactures would also have to be prohibited. As long as there is a free gold market in the United States, gold cannot for any length of time, or for more than a small amount, go to a premium that will be translatable into a premium for American holders of gold. If, however, exports were not unrestricted, exporters could secure premiums, and in the case proposed these exporters would be the owners of gold mines. American gold miners, now able to secure only the fixed mint price of $20.67 an ounce, would, therefore, be placed in a position analogous to that of the miners of the British Empire who are securing premiums in London on their products.

How far will restriction on gold exports affect our newly acquired position as international bankers? If we and others must have certain Oriental products, and can have them at the low prices which cheap labor makes possible, will it be more advantageous to do without these or some of these products, by holding on to our gold, than to have them and pay the price in the media—the precious metals—which the East will accept?

The Wisconsin Geological Survey in 1919 surveyed, as to their economic minerals, particularly iron ores, the sixteen townships in Wood, Eau Claire and Chippewa counties, following: T. 25N, R5E & 5W; and Ranges 5 and 6W in townships North 26, 27, 28, 29, 30, 31 and 32. Blueprint maps may be obtained from the State Geologist. Madison, Wis.

N. Y. Section, Mining and Metallurgical Society Meets

J. E. Spurr Presents Interesting Paper on Control of World's Minerals—Passage of Curtis Bill Urged

At the regular meeting of the New York Section of the Mining and Metallurgical Society of America, on Thursday evening, March 4, an interesting and important paper was read by J. E. Spurr, on the "Political and Commercial Control of the World's Mineral Wealth." J. A. Church, Jr., chairman of the section, introduced Mr. Spurr, who said in part:

"The treasures of commercially valuable ore deposits have been hid by nature whimsically throughout the earth, here and there, by no rule of geography or latitude, and with great disregard of equality. A nation's needs or desires for mineral wealth have no stated relation to its actual mineral possessions; what it needs is often in the territory of another nation which does not need it. Commerce is thus born, and the nation which must have the metal or ore of another country backs up its commerce and helps it to fasten its claims for permanent control of the deposits in question, by legislation, by diplomacy, and, if need be by war. In case of war, the metallic prize falls to the strongest—usually the nation which before, through its necessities, exercised only commercial control, but which, as the result of the trial of strength, now frankly asserts its sovereignty.

"Have we as Americans realized these forces? Absolutely not, I should say. How many realize that the Alsace-Lorraine question is and was not a sentimental one, but a death struggle for the greatest iron deposits of Europe and the second largest of the world, which gave Germany her immense growth and power, and may now transfer that wealth and power to France? That the dispute between Poland and Germany as to Silesia is not a question of nationality, sentiment, or even territory, for it represents one of the greatest coal fields of Europe. If Poland gets it, she may well overtop Germany in wealth and importance. If Germany loses it, she may well drop into the position of a second-rate power, now that she has had to give up Alsace-Lorraine. To submit such a question to the vote of the native population is of the same order of intelligence as tossing a coin for it, but how many of us have understood this? Population shifts and changes, swells or shrinks; may be at one time predominantly Polish and, at another time, mainly German; but the coal deposits are fixed. To clarify these things we should, in place of Silesia, say coal; and in place of Alsace-Lorraine, iron, and so on."

Mr. Spurr then briefly sketched the political ownership of the important metals and minerals. As he concluded, Mr. Church let down the bars, and introduced David White, of the U. S. Geological Survey. Mr. White, in the expressive language of the street, took a fall out of mining engineers in general, and figuratively landed on them with both feet for not going more actively into foreign mining. With his well-known and quizzical smile, he landed blow after blow on the surprised audience, saying that "Are mining men victims of mental paralysis and moral impotency? It seems to me that mining men are lethargic. I wonder if they are alive to crises of the present hour as they affect the industries and the future of the United States?"

Captain Jensen discussed foreign copper deposits. He pointed out that the copper resources of the United States are not limitless, and that now is the time to acquire interests in foreign copper deposits. Sydney H. Ball said: "I think that we, who have tried the foreign mining game, have found that, to borrow a geological term, it is a little hard to work because of the secondary enrichment of foreigners with grape juice and other things." Mr. Ball then called attention to the Curtis bill, introduced into the Senate, and said that it would be a patriotic duty to push this bill, as it would aid in maintaining an open door for the American financier and engineer in foreign countries. A resolution was passed calling the attention of the society's council to the Curtis bill and providing for definite action in furthering its passage.

Lawrence Addicks, H. H. Knox, Robert Peele, Chairman Church, L. C. Graton and others contributed to the discussion, which was interesting, if not onesided.

A. A. E. Offers National Unity Plan

A new plan for a unified engineering organization for the United States is contained in an announcement made by the American Association of Engineers that one-half the entrance fee of $10 will be waived to applicants who are members of recognized national and local engineering societies and clubs of the United States. This arrangement will be in effect only until the sixth annual convention, to be held May 10, 11, and 12, 1920, in St. Louis, unless it is extended by the convention. The resolution is as follows:

"Inasmuch as the support in membership of every professional engineer in the United States is needed by the American Association of Engineers to accomplish professional unity, and inasmuch as many engineers have helped the profession by giving time and money for a number of years to that end through recognized societies and clubs:

"Be it Resolved, that until the 1920 convention (May 10-11) the membership committee be authorized to waive one-half of the entrance fee of $10 to applicants who are in good standing in such recognized clubs and societies and to accept such applications when accompanied by an entrance fee of $5."

The membership of the American Association of Engineers on Feb. 19 was 12,670.

Improvements in Mining Equipment Urged on South African Engineers

J. H. Veasey recently addressed the Association of Certified Mechanical Engineers of South Africa on the subject of "Engineers and Opportunity." Mr. Veasey pointed out that it was incumbent upon engineers to reduce working costs and to re-establish low-grade mines as profit-earning institutions. A great opportunity exists today for engineers in undergroud workings, as insufficient expert attention has been given to simple mining operations such as breaking, shoveling, and stope tramming. According to Mr. Veasey, shoveling averages 1.8 tons per shift per native; in 1912, it was 2.8 tons per native shift, and these records do not begin to compare with American results. Mr. Veasey also called attention to the need for an investigation of drilling. The following interesting observations were made:

"If a hand-held machine is to be designed to replace the hammer-boy, the first item of information necessary is the minimum size of hole to be drilled. Once a ¾ x 42-in. hole was considered perfection for stoping. Recently it has been shown that ⅝ x 30-in. holes are more efficient. In the absence of experiment we have no information that still smaller holes, say ½ x 24 in., would be even more economical, so that, for the present, ¾ x 30 in. must be considered the minimum useful size for stoping. In the matter of drilling speed, the last few decimals of an inch drilled per minute seem to have some resemblance to the last few knots per hour of a torpedo-boat destroyer: both are costly, and in each the materials of construction are being stressed to as near the permissible limit as designers dare go. One inch per minute over drilling and changing time would be half an hour to a hole, or eight holes in four hours. If an allowance of eight and one-half minutes rest were made between holes, this rate would be eight holes in five hours.

"This slower rate of drilling, combined with a finished diameter of three-quarters inch and length of longest steel 3 ft. 6 in., would admit of the use of a very light machine, with considerably reduced stresses on the impact parts. The lines of airplane engine design could be followed, using alloyed metals where their particular properties are required, and the weight thereby reduced to the minimum necessary for inertia.

"The weight of an infantry service rifle could be set up as a goal to be aimed for if not reached. In fact, if the weight was reduced to approximately 12 lb., the machine could be carried in a holster with a shoulder strap. Each native might be allowed to keep his own machine, always carry it with him, and be taught to take a pride in its condition. He would bring it out of the mine with him every shift, and in daylight clean and oil it as carefully as a soldier does his rifle."

THE MINING NEWS

LEADING EVENTS

Col. W. B. Thompson Takes Option on Flin Flon Property

Agrees To Spend $200,000—Plant at Mandy Mine Purchased for Preliminary Work

Col. William B. Thompson has taken an option for one year on the Flin Flon copper property which is situated on Flin Flon Lake in northern Manitoba. The price is slightly under $1,500,000 payable all in cash at the end of the option. It is understood that Colonel Thompson has agreed to spend $200,000 on the property. The option was signed in Toronto during the past week. The plant at the nearby Mandy mine, which belongs to the Tonopah Mining Co. of Nevada, has been purchased and $60,000 worth of equipment and supplies are being rushed in before the breakup. With Colonel Thompson are associated W. J. Judson and C. F. Ayers, also a certain mining company.

It was announced in January that Hayden, Stone & Co., of New York, had dropped the option they had been holding on the Flin Flon. Thereafter various rumors gained ciruclation, one of them being to the effect that the International Nickel Co. had purchased the property. This was incorrect, as now seen, though it is known that certain individuals associated with this company had been considering some sort of a deal.

The Flin Flon deposit has been de-described in *Engineering and Mining Journal* in the issues of Oct. 25, 1919, and Jan. 24, 1920. It contains 20,000,000 tons of primary sulphides running 1.7 per cent copper, 1.5 oz. silver and $1.40 gold.

Van Dyke Copper Co. Claims Shaft-Sinking Record

The Van Dyke Copper Co., of Miami, Ariz., announced on the afternoon of March 4 that it had beaten the world's record for shaft sinking held by the Crown Mines, Johannesburg, S. A., where a circular shaft 20 ft. in diameter was sunk 279 ft. in December, 1918, at an average speed of 9 ft. in 24 hours. The new world's record was made by the Van Dyke company at its No. 1 shaft, which was sunk 308 ft. in thirty-one days, the average being almost 10 ft. a day.

The shaft was officially measured at the beginning of the 3 o'clock shift on Feb. 1, 1919, according to the *Daily Silver Belt*, of Miami, the official committee being City Engineer R. G. Thomas, Rev. G. S. Sloan and W. G. Ellery, assisted by L. D. Van Dyke and E. R. Rice, general manager. On that date the shaft measured 755.6 ft. It was 308 ft. deeper a month later.

Hecla Mining Co. Answers Gertie Complaint

No Ore Removed or Blocked Out in Drifting Through Plaintiff's Ground —Latter Seemingly Consented

The Hecla Mining Co., of Wallace, Ida., has filed its answer to the complaint of the Gertie Mining Co., in which it was alleged that Hecla had trespassed upon the Gertie and Iron King claims from its underground workings and had extracted much valuable ore therefrom, and upon this allegation the Gertie company asked the court for an order requiring the Hecla company to permit plaintiff to make an examination and survey of the underground workings of the Hecla mine. It appears from the answer filed by Hecla that the Gertie claim projects into the Burlington claim, owned by Hecla, from the south, and that in extending its workings easterly through the Burlington claim Hecla admits that the drift passed through a corner of the Gertie; that in running through the Gertie ground the Hecla company removed no ore and developed none, and that no other workings were extended on or beneath any ground owned by the Gertie company.

In justification of drifting across the corner of the Gertie claim, an affidavit is submitted by James F. McCarthy in which he says the drift across the Gertie was surveyed by A. A. Booth, the company's engineer at the time, and who was a director of the Gertie company; and that Mr. Booth told him at that time that there would be no objection on the part of the Gertie company, and that he believes that the plaintiff had full knowledge of the fact at least prior to the year 1912. He further states that he had shown the mine maps to L. W. Hutton, president of the Gertie company, and had given Mr. Hutton permission to make a personal inspection, and also to permit Mr. Booth to check up his survey.

The Hecla answer further states that to "permit the plaintiff to make the survey, inspection and examination of its many mine openings and workings within its own property would be a violation of the rights of this defendant, the taking of its property without due process of law, and a violation of its property rights." No date has been set by the court for the hearing.

The Warrior Copper Co.'s property near the Inspiration mine in the Miami district, Arizona, is reported to have been sold to the Inspiration Consolidated Copper Co. for $500,000. About 800 acres are comprised in the Warrior holdings. Spencer D. Wright, of Philadelphia, is president of the Warrior.

Work in the Cariboo Hampered by Placer Mining Act

Hydraulicking Has Been Successful in Spite of Difficulties

BY DONALD D. FRASER

Up to date the Cariboo district of British Columbia has been hampered by the Placer Mining Act which has done much to retard development. Leases one-half mile long have been staked and held without development or payment of rentals. This is not only true in a few cases but is the general condition of the district. This is well emphasized by these facts: Out of over 600 leases, 24 had their rentals paid up to date this year and official figures show that back rentals amount to over $303,000. The major portion of these leases were undoubtedly staked for speculation only and held for outrageous prices. In many cases people desiring to spend capital in the district have been driven out by this state of affairs. A change has been promised by the Minister of Mines which will alter these conditions through a new act, which is to be presented at the present session of the provincial House. Under this new act a certain amount of work is to be necessary each year together with a nominal rental. In case the conditions are not met the lease will automatically cancel itself. The working of this act should throw open much ground now held for speculation with the consequent development of the district.

To the man with capital to invest in hydraulicking or dredging ground, Cariboo offers a large opportunity. The problem of the deep drifting ground still awaits the successful engineer.

The gold fields of Cariboo cover an area of about 7,000 square miles. They lie on the western slope of the Rockies with the Cariboo Range to the east and the Fraser River to the west. From the Horse Fly River to the south they extend north nearly to the Grand Trunk Pacific Railroad. The mining center is the town of Barkerville on Williams Creek.

The Cariboo Range has a northwest-southeast trend with peaks rising to an elevation of nearly 8,000 ft. Proceeding westerly are other minor ranges which rise to altitudes of 5,000 and 6,500 ft., which gradually slope to the Fraser and Quesnel rivers. The Cariboo Range shows but little sign of glaciation for it is very rugged with sheer walls and sharp peaks. The territory which embraces the Cariboo district, however, shows signs of intense glaciation. The mountains are rounded and covered with glacial debris. The existing creeks have cut deep valleys and gorges through this glacial ma-

terial, forming valleys which are floored with heavy strata of glacial debris.

The country rock, or bedrock as it is termed, is composed of different varieties of schists and slates which are cut by numerous quartz veins and quartz stringers. The quartz frequently carries free and combined gold. The scouring of the country by glaciers wore away these schists, ground up the quartz and set free the gold, which was concentrated into the creek bottoms. The gold found near the foot hills of the Cariboo Range is heavy and coarse but as one follows down the streams the gold gets finer until the flour and flake gold of the Fraser and Quesnel rivers are reached. As a rule the gold lies either on the bedrock or else on a false bedrock. There is undoubtedly a certain amount of gold distributed throughout the gravels, but, except in a few cases, it is negligible. It is common practice to take up one to two feet of bedrock to recover the gold which has worked down into the crevices.

Sinking and drifting in the creek beds of the district is both difficult and expensive. The ground is generally loose, permitting the water to penetrate freely into the workings. Strata of silt or "slum," as it is locally known, are encountered. When water gets into this material it is extremely difficult to hold. It is necessary to use heavy timbers and keep the workings enclosed with strong lagging. Face boards are usually employed.

In both Williams and Upper Lightning creeks, the shafts were shallow, being less than 100 ft. to bedrock. Although the ground was porous and strata of slum crossed, it was possible to keep these workings open, as the water pressure was not excessive. As long as they could keep down the water, they were all right. Nearly all of Upper Lightning Creek was worked simultaneously by a number of companies. Cornish pumps were used. No one company could successfully combat the water but when all had their pumps going the water was controlled.

These companies were controlled mainly by working men and men of small means. Although they believed, and in some cases knew, that rich ground was awaiting the successful miner farther down the valleys, they were unable to cope with the difficulties, nor were they able to finance such undertakings. Various engineers and practical miners, however, successfully sought outside capital and undertook to mine the lower valleys. These workings were from 100 to 350 ft. deep. Strata of slum were encountered which, when added to the very heavy water pressure, produced great difficulties. Shafts were lost and in other cases the workings were flooded. In no case were they successful financially. Added to the great natural difficulties in some cases was lack of managing and engineering ability, wildcatting and lack of conscientious endeavor.

Although to date the exploration of the deep drifting ground has been unsuccessful, hydraulicking has been a great success. Wildcatting, poor management and lack of ability have figured in this phase of operations in the Cariboo as well as in the drifting ground. Remarkably few hydraulic undertakings which have been prosecuted in good faith, however, have failed. At present various companies are successfully hydraulicking on Lowhee Creek, Stouts Gulch, Mosquito Creek, Grouse Creek and Perkin's Gulch, and other creeks are being opened. The season is short and the water supply small, but the ground has proved rich enough to overcome these difficulties.

The creeks mentioned above as being successfully hydraulicked are all within the area which yielded enormous riches in the old days. In fact practically all the work done in the district has been limited to the sections proven by the early miner. With one or two exceptions little or no attempt has been made on any scale outside of these sections. The remainder of the district, which embraces by far the greater part of it, has been prospected here and there and gold found in quantities which would repay large scale operation but not the man with the rocker. The greater part of this area is covered with a heavy overburden of glacial material. To prospect this area successfully a drill should be used.

HIDDEN CREEK MINE OF GRANBY CONSOLIDATED MINING, SMELTING & POWER CO., AT ANYOX, B. C.

B. C. Settler's Rights Act Disallowed by Ottawa

Granby Consolidated's Title to Cassidy Collieries on Vancouver Island Thereby Weakened

The Settler's Rights Act of 1919, with which is involved the title to a considerable section of coal lands along the Esquimalt & Nanaimo Railway that was built on Vancouver Island, has been disallowed by the dominion government. The act was passed last session by the British Columbia legislature and gave pioneer settlers within the said belt, or their legal descendants, up to Sept. 1 of last year to make application for coal rights within their several holdings. The act, however, was never effective because the lieutenant governor refused his assent to the provisions contained.

The announcement from Ottawa that it has been formally vetoed shifts the issue back upon the shoulders of the provincial government. It is thought likely that, in view of the latter's contention that the federal administration is stepping outside of its jurisdiction in blocking the provincial legislature on this question, the act will be re-enacted at this session. On this point there has been no official announcement issued.

The Settler's Rights Act of 1917 was the first legislation of the kind passed by the present government. It, too, was disallowed by Ottawa but not before a number of provincial licenses to coal rights within the Esquimalt & Nanaimo Ry. belt had been issued. One or more of these licenses passed into the hands of the Granby Consolidated Mining, Smelting & Power Co. with the result that the Cassidy collieries were opened up on the island to obtain coal for the by-product coking ovens at Anyox, B. C., where the company's copper smelter is situated. The soundness of the company's title is now the possible subject of litigation. The importance of the issue may be further gaged when it is known that within the Esquimalt & Nanaimo belt there are nearly thirty-three hundred square miles of land much of which carries coal.

North Side Operators of Coeur d'Alenes Want Railroad

Seek To Force O.-W. R. & N. Co. To Rebuild Fourteen-Mile Line From Prichard to Paragon

Now that the railroads are restored to their owners, the mining interests in the section of the Coeur d'Alene district of Idaho, commonly called the North Side, have started a movement to force the O.-W. R. & N. company to rebuild its line from Prichard to Paragon, a distance of about fourteen miles. This track was washed out two years ago by an unusual freshet, and the failure of the company to rebuild it, due in a measure to Government control, imposed a great hardship upon that section by practically forcing a suspension of ore shipments and discouraging mining development. The mining interests have now brought the matter to the attention of the State Utilities Commission, and a hearing will be held March 8 in Wallace, when the railroad company will be required to show cause why it should not be required forthwith to reconstruct and operate the line. The mining companies, supported by the business men of the county in general, will be prepared to show that a large tonnage is available and that the reconstruction of the road is a public necessity. There are four mines in shape to ship lead-silver and zinc ores, three of which have mills of 150 ton capacity. Numerous other properties are being developed and have a promising outlook for early shipments. Besides mining, there are large tracts of timber accessible to the railroad.

Bingham Strikers Vote To Return to Work

The strike at Bingham Canyon, Utah, is over, and conditions are fast returning to normal. At a meeting of those who had been disaffected, who, as has already been stated in these columns, did not represent the camp, it was unanimously voted to return to work. This meeting was presided over by Albert Wills, reputed to be the I. W. W. organizer in Utah. Before this meeting all but about a hundred of the strikers, it is estimated, had either returned to work or left the camp. During the strike a meeting of protest against I. W. W. methods was held at the Bingham Commercial Club and it was voted to appoint a committee from the workers to meet with the operators. Arrangements for such a meeting are stated to be in progress. The Bingham Commercial Club has been active recently. A drive for increased membership was recently undertaken with a view to including as many workers as possible in the organization.

The National First-Aid and Mine Rescue Meet will be held in Denver, Aug. 20 and 21. The meeting will be under the auspices of the U. S. Bureau of Mines, and it is expected that there will be present at least fifty teams from coal and metal regions.

New Freight Rates Announced on Southwest Fluorspar

The chairman of the San Francisco district freight traffic committee has given instructions to publish the following freight rates on fluorspar from California, Arizona and New Mexico points to the east as follows:

	From		
To	Arizona Per Ton	California Per Ton	New Mexico, Per Ton
New York territory	$11.50	$13.50	$9.50
Pittsburgh territory	10.50	12.50	8.50
Detroit-Cincinnati territory	10.50	12.50	8.50
Chicago territory	9.00	11.00	7.00
St. Louis territory	9.00	11.00	7.00

The new freight rates, which were put into effect about March 1, have already stimulated production in the Lordsburg district of New Mexico. Norman Welch, of Gage, N. M., reports 45,000 tons of ore blocked out on his property in the vicinity of Deming and will erect a 50-ton mill there to clean it. He will turn out both fine and gravel sizes in washed grades. Other interests are also figuring upon the Young Bounds properties, north of Separ Station, 20 miles east of Lordsburg, N. M., where further development will be done and, if conditions justify, a 50-ton mill will be installed to concentrate the ores, which are free from all impurities except an excess of silica in the lower grades. Only a small percentage of the ores will require milling, save for crushing, to meet the sizes demanded in the market.

The management of the Great Eagle fluorspar mine, 30 miles north of Lordsburg, N. M., on the Gila River, is arranging to begin shipping soon. There are 3,000 tons of ore broken in stopes and bins. This is the largest fluorspar deposit in the southwest. The vein is opened for 1,000 ft. in length and to a depth of 130 ft., the width being from 4 to 25 ft. of high-grade ore. The vein can be traced for over 3,000 ft. on the surface and seems to be of an average width of 10 ft. These ores are shipped without milling and average better than 90 per cent CaF, mine run. All the properties mentioned were opened during the war and were regular producers.

Railroad into Iron County, Utah, Planned

A railroad into Iron County, Utah, now seems assured and will make available the extensive iron and coal deposits of the section. The Old Capitol Petroleum Iron & Fuel Co. is sponsor for this important undertaking, and has made application to the state utilities commission for a certificate of convenience to construct a branch line running from Lund, on the Salt Lake Route, to Cedar City over a distance of about 35 miles. The estimated cost of the new road is $500,000, and capital will be supplied by Salt Lake and Eastern men. In addition to its mineral wealth, the district is important agriculturally, and has timber resources. Conditions are also favorable to the further development of the sheep and cattle industry.

British Columbia Wants an Iron and Steel Industry

Agitation Revived With Reopening of Provincial Legislature—Government Financial Aid Sought

BY ROBERT DUNN

An iron and steel industry is what residents of British Columbia most want at present. They argue that, given such an industry, all the rest will follow. The Boards of Trade of Vancouver and Prince Rupert, and the Municipal Council of Victoria, are among organizations that have taken up the agitation. The press is a unit in support of the movement and there is every reason to believe that considerable pressure will be brought to bear to induce the provincial government to formulate a policy either along the lines of direct action or of so encouraging a character that the investment of outside capital and the achievement of results will be assured.

That British Columbia possesses the necessary resources is conceded. Although its magnetite iron ore deposits have not been thoroughly proved, it is believed by many that there is sufficient material awaiting development to keep a blast furnace plant of fair capacity in operation. Properties on which work has been done, and the many on which nothing more than assessment work has been performed every year, have shown up so favorably both in respect of quantity and quality that the point is never argued, at least locally. But, it is admitted, this "we take it for granted" attitude, cannot be expected to satisfy prospective investors, who are being asked to put real hard cash into the proposition.

This, presumably, was one of the influences responsible for the enactment in 1917 of the Mineral Survey & Development Act under which six engineers were appointed over an equal number of districts, the province being so divided by its terms. These engineers have now been in the field for two years and have proved of great value both in the acquiring and the disseminating of accurate knowledge of mineralized zones and in helping prospectors and mine operators. Considerably more, too, is known of the iron ore of the province. It is true that the survey is not yet complete, but the country is vast, and two years is not a long time in a comparative sense. William M. Brewer, one of the district engineers, has done much of this work. One of his most notable recent trips was into the Whitewater River District, Lillooet Mining Division, where he reported having found very large deposits of limonite and hematite of excellent smelter grade. This is to be more fully investigated during the coming summer, and if Mr. Brewer's conclusions, based on a necessarily cursory examination, are confirmed, whatever question might have arisen as to British Columbia's ability to feed a modern blast furnace plant will have been eliminated.

It is well known that in 1918 the government passed what is known as

the "Iron Bounties Act," offering $3 a ton of 2,000 lb. for pig iron manufactured in the province from provincial ore and $1.50 a ton for pig iron produced in the province from foreign ore. Although this has failed in its object up to the present, it has been successful in directing the attention of many outside the country to its possibilities. This is proved by the inquiries which Hon. Wm. Sloan, Minister of Mines, announces he has received. It is substantiated further by the several special types of electric furnaces that have been tested.

Then the session of the Provincial Legislature, 1919, passed the Iron-Ore Supply Act. Briefly, this gave the Minister of Mines authority to enter on any iron ore property and to have taken away an amount of ore not exceeding 10,000 tons "for treatment for experimental purposes in aid of the development of the iron and steel industry in the province." Action was taken under this Act last summer when some Texada Island ore was used in an electric furnace constructed near Vancouver, B. C., from plans furnished by Mr. Fleet, an eastern Canadian expert. The furnace, however, did not do what its designer expected and what others interested ardently hoped for.

While referring to the electro-thermic method of treating British Columbia magnetites it would not do to omit a mention of the report of Dr. Alfred Stansfield, of the metallurgical department of McGill University, Montreal, Que., which deals exhaustively with this subject. Dr. Stansfield finds no difficulty preventing the electric treatment of the magnetite ores of this province, but questions the commercial feasibility of the industry owing to the high quotations on power given him during his investigation. This report is available on application to the Department of Mines, Victoria, B. C.

With the reopening of the Provincial Legislature the agitation for the establishment of an iron and steel industry has revived. Its force, it would appear, has been but pent up over the recess to burst with excessive violence with the re-assembly of the legislators.

F. A. Pauline, one of the provincial members, discussed the question recently, drawing attention to an electric smelting plant established in the neighborhood of Seattle, Wash., and producing from British Columbia ore pig iron of as high grade as any of the Swedish or Norwegian output. A. P. Gillies, a promoter, is asking that the Provincial Government guarantee the interest on a $5,000,000 bond issue in order that the industry may be launched.

A bill is before the British Columbia legislature providing that the Mineral Act be amended so as to give government authority to reserve from location and mining for iron all lands containing iron ores which are not privately held and to dispose of such reserved lands on such terms as to royalty per ton removed as may be deemed advisable. The life of this measure is set at three years.

Court To Interpret Nevada Bullion Tax Law

State Will Bring Suit Against Tonopah Extension Mining Co. in Friendly Action

What is described as a "friendly suit" for the purpose of obtaining judicial interpretation of certain sections of the Nevada bullion tax law will shortly be instituted by the state authorities in the district court of Nye County, according to an announcement made by Henry M. Rives, secretary of the Nevada Mine Operators' Association. This action was decided upon following a conference between mine operators and state officials held for the purpose of reaching an agreement as to the procedure and as to facts which may be stipulated in advance for the purpose of expediting the proceedings.

For some years there has been controversy between county and state officials on the one side and mine operators on the other as to just how much taxes on the bullion produced should be paid under the law. It is now determined to have the matter passed upon by the court and, it is hoped, settled once and for all. The title of the suit will be the State of Nevada vs. Tonopah Extension Mining Co., with the state tax commission as intervenor. It is not considered likely that preliminaries can be disposed of and the suit prepared for filing in less than a month.

West End Consolidated's Potash Holdings Transferred

The F. M. Smith interests, of Oakland, Cal., have incorporated the West End Chemical Co. and the West Opoteca Mines Co. with a total capitalization in equal parts of $6,000,000. The new companies, according to Louis W. Bennett, attorney for Smith, will take over the Searles Lake potash and the Honduras silver holdings of the West End Consolidated Mining Co. The directors are the same in both companies and all are employees of the so-called Smith organization, the Oakland Realty Syndicate. The directors are Louis W. Bennett, James R. Blair and C. A. Mullen.

Under the articles of the chemical company provision is made to develop, refine and manufacture borax and potash and mineral products in the Searles Lake region in San Bernardino County. The Opoteca Mines Co. activities are to be undertaken in Honduras through central offices in Oakland.

The article published on p. 462 of *Engineering and Mining Journal* for Feb. 14, referring to a decision by a Nevada court on the right of a minor to convey mining property, should have stated that the decision was based on a special statute, enacted in 1869, providing that, in the absence of fraud, a conveyance of mining interests by a minor over the age of eighteen years, if otherwise sufficient in law, shall be held valid and not subject to revocation (R. S. Nev. 1912, Par. 1103-4).

Seek Experimental Station for Moscow, Idaho

Authority having been given the U. S. Bureau of Mines to establish an experimental station either at Moscow, Idaho, or Reno, Nev., a determined effort will be made by the mining interests of the Northwest to bring it to Moscow. The first step in that direction was taken at the recent Northwest Mining Convention at Spokane, when a strong resolution was adopted favoring the Idaho city. There is now a substation at Moscow in connection with the state school of mines, which has proved to be a most useful agency, and which at the same time has emphasized the need of a station having enlarged facilities for experimental work.

Vocational Education in Joplin-Miami Zinc District

Supervisors of industrial education from three states, Kansas, Oklahoma and Missouri, in co-operation with Frank Cushman, Federal agent for industrial education, with headquarters at Indianapolis, Ind., have been making an industrial survey of the Joplin-Miami zinc and lead district with the aim of definitely shaping the movement for vocational education in the mining field. Mr. Cushman addressed the meeting of the Tri-State branch of the American Zinc Institute at Picher, March 3, and was promised hearty support of the operators in the vocational training work.

M. C. M. Building Burns

Koenig Hall, the chemistry building of the Michigan College of Mines, was destroyed by fire March 4. The loss was $75,000, estimated on a replacement basis. The building was erected in 1902. It was named Koenig Hall in 1914, in honor of the memory of the man who for many years was the head of the department. The original cost was $40,000.

Recent Production Reports

Anaconda Copper Mining Co. produced 18,500,000 lb. copper in February against 18,100,000 in January.

Burma Corporation, Namtu, Burma, produced in January 5,461,120 lb. of lead from 6,103 tons of lead bearing material, including secondaries; 3,721,440 lb. refined lead; and 205,830 oz. refined silver.

Old Dominion smelter, Globe, Ariz., produced 2,103,000 lb. copper in February, against 2,504,900 in January.

Miami Copper Co.'s production in February was 4,089,520 lb. copper against 4,461,247 in January.

Chile Copper Co. produced 7,508,000 lb. copper in January, against 6,016,000 lb. in December.

Butte & Superior Mining Co. in February produced 11,000,000 lb. zinc in concentrates and 210,000 oz. silver, compared with 13,000,000 lb. zinc in concentrates and 215,000 oz. silver in January.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Awards Recommended by War-Minerals Relief Commission

Claims Granted Sixty-Nine, 476 Having Been Disallowed—Total Amount Involved $5,121,333.69

A résumé of the activities of the War-Minerals Relief Commission to date shows that 476 claims have been disallowed. The amount claimed in these 476 cases aggregates $2,937,830.75. Awards have been recommended in sixty-nine claims. The amount claimed in these sixty-nine cases was $2,183,502.94. Thus the total number of claims acted upon is 545 and the total amount claimed in all of the cases acted upon is $5,121,333.69.

Of the 476 claims disallowed 426 were rejected because a careful examination of them showed that there was no Government request or demand. In thirty-two cases the properties were held not to be of commercial importance. In twelve cases claimants were found to have suffered no loss. Four claims were rejected because the minerals sought are not covered by the War-Minerals Relief Act, and in two cases it was found that the only loss sustained was through purchase of property.

A complete list of the awards recommended by the War-Minerals Relief Commission to date, showing respectively for each claim the claimant, the mineral, the amount recommended and its percentage relation to the amount asked, is as follows:

Chestatee Pyrites and Chemical Co., pyrites, $223,529.17, 24 per cent; Benjamin J. Hatmaker, pyrites, $373.60, 74 per cent; National Pyrites & Chemical Co., pyrites, $40,506.99, 21 per cent; G. T. Pinson, chrome, $212, 12½ per cent; Maryland Chrome Co., chrome, $37,385.36, 68 per cent; Cushman Manganese Co., manganese, $4,007.27, 61 per cent; Boulder River Chrome Co., chrome, $1,517.78, 10.98 per cent; Chrome Mining Co., chrome, $16,410.62, 58 per cent; Walter H. Denison, manganese, $33,314.21, 54.05 per cent; Tyner, Pittard & Sloan, manganese, $186.40, 9 per cent; Collier Mines Co., manganese, $9,121.41, 14 per cent; L. H. Van Horn, chrome, $5,568.43, 50 per cent; G. L. Finister, chrome, $3,246.19, 31½ per cent; U. S. Canadian Manganese Co., manganese, $17,675.58, 79 per cent; Oscar Reinholt, manganese, $1,456.25, 58 per cent; Parker, Shepherd & Wilson, manganese, $10,219.85, 25 per cent; O. G. Avary, chrome, $710.00, 71 per cent; Evans W. Buskett, manganese, $583.88, 32 per cent; J. F. Reddy, chrome, $56,376.89, 56 per cent; Pine Creek Tungsten Co., tungsten, $77,360.53, 26 per cent; Elco Manganese Corp., manganese, $5,275.28, 70¼ per cent; John C. Shepherd, manganese, $1,292.55, 27½ per cent; White Horse mine, manganese, $468.97, 2 per cent; Butte & Plutus Co., manganese, $3,952.39, 18 per cent; Logan Rives, manganese, $23,047.36, 52½ per cent; Mortimer Savage, chrome, $490.90, 44½ per cent; W. O. Houck, manganese, $1,836.32, 59½ per cent; Samuel H. Dolbear, chrome, $10,995.15, 70¾ per cent; J. S. Shields, chrome, $317.20, 30½ per cent; Herbert Wilson Smith, manganese, $16,908.78, 81 per cent; John Anderson, chrome, $780.60, 71¼ per cent; C. E. Hansen, manganese, $180.50, 36.42 per cent; Atherton Shafer, et al, chrome, $470.11, 58 per cent; Victor C. Dillman, manganese, $2,263.45, 32.48 per cent; L. H. Payne & Co., chrome, $7,862.44, 35 per cent; R. S. Handford, manganese, $9,323.55, 73.1 per cent; R. A. Baker, manganese, $992.60, 56 per cent; George E. Brown, chrome, $223.25, 31.89 per cent; G. E. Roberts, secretary, Polk Bayou Mining Co., manganese, $835, 28¾ per cent; Arata & Palmer, chrome, $302.30, 11 per cent; John E. Secrest, manganese, $206.25, 19½ per cent; John W. Pomeroy, chrome, $847.00, 22 per cent; Playter Brothers, manganese, $1,046.43, 17 per cent; W. H. Beatty, manganese, $2,837.42, 94.92 per cent; Robert L. Kidner, manganese, $461.43, 4 per cent; Seagrave & Gasram, chrome, $24,057.76, 75½ per cent; Bluefield Manganese Co., manganese, $419.96, 17 per cent; Craig, Creighton & Graham, manganese, $8,985.71, 49 per cent; Sherman Costello, chrome, $157.55, 50 per cent; R. H. Lake, chrome, $516.92, 28½ per cent; Harrison Bingham and R. V. Hayden, chrome, $275.75, 23½ per cent; N. E. and E. E. Hayes, manganese, $228.50, 25.9 per cent; J. B. Dowling, chrome, $672.40, 62½ per cent; I. B. Sovy, chrome, $167.75, 43 per cent; Chastian Brothers, chrome, $1,034.40, 27 per cent; N. Lambert, manganese, $385.23, 26 per cent; Leader Manganese Co., manganese, $8,750.00, 58 per cent; C. P. Haight, chrome, $58.67, 22 per cent; Andrus & McCorkle, chrome, $1,407.59, 38 per cent; Niven, Patterson & Hazeltine, chrome, $195.54, 4½ per cent; Marks, Guernsey & Patterson, chrome, $856.47, 44½ per cent; W. C. Green, chrome, $555.10, 56 per cent; D. E. Wiley, chrome, $605.00, 60½ per cent; H. H. Noble, chrome, $32,612.32, 93 per cent; P. F. Chandler & C. P. Haight, chrome, $351.99, 5½ per cent.

Magnesite Tariff Bill Reported to Senate

Spurred by Senator Poindexter's demand that the Magnesite Tariff Bill be placed on the Senate calendar prior to the vote on the Dyestuffs Embargo Bill, the Senate Finance Committee has reported out the measure exactly as it passed the House. The bill places a duty on magnesite and commercial ore, either crushed or ground, of one-half cent per pound; magnesite, calcined dead burned and grain, three-fourths of a cent per pound; magnesite, brick, three-fourths of a cent per pound and 10 per cent ad valorem. In urging the passage of the measure, the committee's report makes, among others, the following points:

"Prior to the war magnesite was imported from Austria at a cost of $15.75 per ton. It was stated that the cost at the mines in that country was about $7 per ton. The railroad rates and dock charges amounted to about $2 per ton and the ocean rates to Atlantic ports were about $2 per ton. The average cost of that produced in the

STATUS OF PENDING MINING LEGISLATION

Subject of Bill	*Bill No.*	*Author*	*Present Status*
Silver in coins	*H.R.* 11,226	*McFadden*	*Before House Committee*
Met. Min. in Ind. Res.	*S.* 287	*Ashurst*	*On Senate Calendar*
Leasing	*S.* 2,775	*Smoot*	*Conference report accepted by each House. Awaiting President's action.*
Timber for mining purposes	*S. No.* 1	*Pittman*	*Passed Senate Oct.* 3, *before House Committee*
Anti-dumping	*H.R.* 10,918	*Fordney*	*Passed House Dec.* 9, *before Senate Committee*
Laboratory glassware	*H.R.* 7,785	*Bacharach*	*Passed House Aug.* 2, *on Senate Calendar*
Magnesite	*H.R.* 5,218	*Hadley*	*Passed House Aug.* 7, *on Senate Calendar*
Tungsten	*H.R.* 4,437	*Timberlake*	*Passed House Aug.* 21, *before Senate Committee*
Zinc	*H.R.* 6,238	*McPherson*	*Passed House Sept.* 2, *before Senate Committee*
Liberalization War Minerals Relief Act	*H.J. Res.* 170	*Garland*	*Before House Committee*

United States, at the mine, is about $25 per ton, and the freight is from $10 to $16 per ton, depending upon destination, so it will be seen that it will require a tariff of at least 1½c. per lb. to cover the differential.

"The hearings before the House committee disclosed that Austrian labor in the magnesite industry received from 20c. to 40c. per day, and that the American Refractories Co. stated that Austrian labor received $1.10 per day. In considering the labor question it should be remembered that in Austria they work 12 hours per day, while in America they work 8 hours per day. It is estimated that the direct and indirect labor charge in the magnesite industry in this country is from 75 to 80 per cent of the total cost of production."

Laboratory Glassware Bill on Senate Calendar

Without amending the laboratory glassware and scientific instruments tariff bill, the Senate Finance Committee has reported out the measure, which provides a duty of 60 per cent ad valorem on laboratory glassware and 45 per cent ad valorem on scientific instruments.

Salary Increases Authorized for Patent Office

Increases in salary ranging from $600 to $1,500 a year for the technical employees of the Patent Office are authorized in a bill which passed the House March 5. Work in the Patent Office has reached a stage akin to demoralization because of the difficulty of securing technical men at the salaries paid. Most of the trained personnel has entered private employment, to the great detriment of the service. Such a good case was made out that, despite the economy campaign, there were only six votes against the increases.

The matter of establishing a Patent Court of Appeals was held in abeyance due to the fact that no practical proposition for the operation of this court was devised.

Regulations to cover leasing under the new General Leasing Act (Oil Lands Leasing Act) have been completed and are now before the Secretary of the Interior for his approval. The regulations will not be made public until after printed copies sufficient for general distribution are available.

NEWS BY MINING DISTRICTS

ARIZONA

Dardanelles Cuts Vein—Shannon Investigating Oil Propositions—Source of U. V. Ex.'s Dividends

Chloride—The Dardanelles crosscut reached the vein at 45 ft. The ore opened up averages $16 across 30 in. Ten inches on the foot wall assayed $46.46 and a selected sample carried $94.59 in gold and silver. This is a new strike for the camp in virgin ground. The company is now drifting north and south on the vein at the 100-ft. level.

Gleeson—The Shannon Copper Co. in notifying stockholders of its annual meeting held on March 17 in Boston stated that it has net quick assets of $453,598, of which cash and United States treasury certificates make $443,723. It stated further that when the sale of the company's properties in Clifton and Metcalf to Arizona Copper Co. was consummated it received $600,000 which enabled the company to discharge all debts leaving a balance of $431,457. It still owns the Leonard group of mines at Gleeson, Ariz., and the Yaeger group at Dewey. The directors of the company have investigated some promising oil propositions.

Jerome—Stockholders of the U. V. Extension inquiring as to the source of the $2,362,500, or $2.25 per share, distributed as dividends last year, have been informed that $1,756,000 of the amount came from 1918 earnings while the remainder was from accumulated earnings of 1917.

COLORADO

San Juan Cut Off by Heavy Storm—O'Donovan Rossa Property at Leadville To Be Worked

Loveland—Discovery of gold and copper bearing ore on Carter Mountain, twenty miles northwest of Loveland, has led to the incorporation by local interests of the Gold Reef Mining Co.

Telluride—For more than ten days an almost continuous storm has prevailed throughout the mining districts of southwestern Colorado, partially cutting off the mining towns of Ouray and Telluride and completely isolating Silverton, Durango and Rico. Blizzards and snow slides in the higher altitudes, and softening roadbeds and rock slides below, have caused the suspension of train service throughout practically all of this territory, and ore shipments will be more more or less restricted for thirty days or more.

Montrose—Great activity is manifested in the vanadium and uranium districts of Montrose County and the output will undoubtedly exceed that of any previous year. A new strike in Naturita Canyon, near Redlands, is attracting much attention.

Leadville—A new discovery of great promise has been made by lessees on the Gertrude mine, located at the head of Colorado Gulch, a few miles west of Leadville, in a territory heretofore considered non-producing. Four cars of ore returned between 80 and 140 oz. silver and about 0.65 oz. gold.

The Leadville Leasing Corporation has been organized by local people to operate the famous O'Donovan-Rossa property on Breese Hill. Work on the property was suspended on account of flooding in 1907 and the low price of silver did not then seem to justify the necessary outlay for equipment to unwater. Much of the ore ran high in silver with from 15 to 30 per cent lead.

The American Smelting & Refining Co. blew in another furnace at the Leadville plant the first of the month to take care of the increasing ore shipments that are coming in from this district.

Aspen—Shipments have commenced from the new strike on the Libby Belle property of the Park Tunnel Co. The mine, which was closed down in the early nineties, was recently reopened and will again materially figure in the Aspen output.

MONTANA

Wickes—The old Alta mine, situated in the Wickes-Corbin district near Helena, is to be reopened after twenty-five years idleness. Thomas A. Merritt, of Duluth, and John Costin, of Virginia, Minn., will finance the venture. L. S. Ropes, of Helena, will be in charge. Two shifts have been started on crosscutting, development and exploration work on the 12th and 13th levels. The property was recently unwatered. The mine is credited with a production of $32,000,000. It was located in 1864 but not extensively worked until 1876.

Marysville—High-grade gold ore was recently discovered in the old Bell Boy mine now held by L. S. Ropes and C. C. Sinnott. The property is situated in Towsley Gulch.

Helena—Cal Stevens, of Helena, recently completed a deal through J. W. Anson for transferring on a bond and lease involving $20,000 the Magpie group of claims, in the Scratch Gravel district, which have been taken over by associates of the Greenough Brothers, of Spokane. The claims have been developed by several shafts to depths of 150 and 200 ft. Ores carrying copper, gold, silver and lead have been struck.

NEVADA

Goldfield Consolidated's Annual Report—Cortez Mines Taken Over by New Company

Goldfield—The Goldfield Consolidated Mining Co. has just issued its thirteenth annual report. It shows that all mining was discontinued by the company on Jan. 31, 1918, and on Feb. 1, 1919, a lease was granted to the Goldfield Development Co. for a period of five years at a rental of $500 per month, together with royalties on the net return from ore shipped by the lessee. On July 1, 1919, a lease was also granted to the Development Co. covering all of the milling plants of the Consolidated, for three years, the lease to be extended to five years pro-

vided a definite quantity of ore is being treated in the mill at the end of three years. For this lease the Consolidated is to receive as rental an amount based on the quantity and value of the ore treated in the mill each month, but not less than $500 per month.

General Manager Julian's report shows that after mill operations had ceased a general clean-up of the refinery and interior of the mill was conducted by the company and resulted in net returns of $124,671.50. Following this, a lease was granted on the mill premises for a period of one year, to insure a more thorough clean-up, and this has so far resulted in profits of $78,600.43, of which the Consolidated received as royalty $42,834.39.

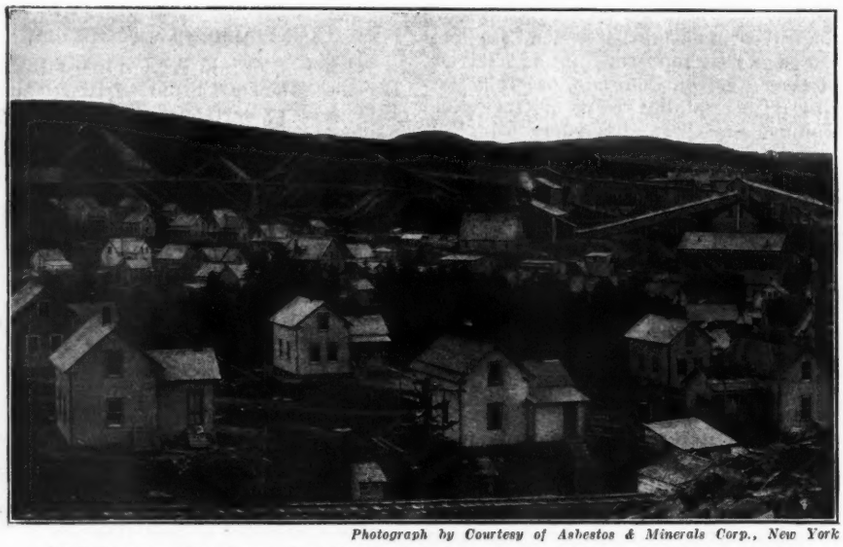
Since Feb. 1, 1919, the Goldfield Development Co. has mined and shipped 4,452 tons of ore, having a net value of $74,986.31, the Consolidated receiving as royalty $13,142.49. No ore has yet been treated in the mill by the Development Co., but a large part of the equipment has been overhauled and placed in condition for operation by that company.

The value of mine and mill stores on hand at this time is $105,012.47. The value of equipment sold during the year was $24,492.10.

Cortez—The Consolidated Cortez Silver Mines Co. is a recent incorporation which has taken over the properties of the Tenabo Mill & Mining Co., at Cortez, Eureka County, in north central Nevada. The latter company was founded in 1864 by the elder George Hearst and Simeon Wenban, and the Cortez mines, which were noted producers fifty years ago, helped found the Hearst fortunes. The Wenban estate has controlled the properties for the last half century, but in 1888 the Bewick-Moreing Syndicate organized a British company, "Cortez Mines, Ltd.," which managed the mines and mill until the end of 1891. Difficulties over financial matters between the British syndicate and the Wenban family caused the mill to close down in 1892 and it never was reopened.

It is claimed that the authenticated production of the Cortez mines approximates 7,500,000 oz. silver and $500,000 gold recovered from 125,000 tons of ore, the average recovery for twenty years up to 1889 being 64.41 oz. silver per ton. The U. S. Geological Survey Bulletin 408 estimates the mill tailings at the Garrison mine at 120,000 tons, which the new owners believe will average 7 to 10 oz. silver per ton. The tailings also contain valuable quicksilver. The record of production, costs, profits, dividends, etc., for 1889, 1890 and 1891 show that a total of $671,577 was paid in dividends for those three years, after the richer ores were presumably extracted and at a time when silver was at a low price.

The plans of the new management call for the re-treatment of the 120,000 tons of mill tailings, and the mining and treatment of the estimated 68,000 tons of developed and partly developed ore left in the company's Garrison mine above the main tunnel and on the dumps. The company further proposes to open up the Garrison mine at depth by completing the tunnel that was almost finished in 1895 at 300 ft. vertical depth below the present workings.



Photograph by Courtesy of Asbestos & Minerals Corp., New York

VIEW OF THETFORD MINES, QUEBEC, WITH ASBESTOS MILLS AND DUMPS IN BACKGROUND

Lafayette—The high rate of exchange between the United States and Canada is given as the cause of shutting down the Lafayette mine, of which Mark Bradshaw is manager and which is located in the camp of that name, south of Candelaria. British Columbia bankers have been financing the Lafayette, but an effort is being made to raise the money in California for a resumption of operations.

Manhattan—A station is being cut at the 800-ft. point in the White Caps shaft at Manhattan. A double drum 100-hp. hoist has recently been ordered by the management.

Reservation — The Review Silver Mining Co. is planning to start work soon on a tunnel to develop its property in Mineral County, and a large compressor and machine drills will be ordered. The values are in silver, lead and gold.

Loring—The 30-ton Gibson mill erected by the Jose-Davis company to treat ore from the Sheepherder mine at Loring is completed and in operation. A boarding and bunk house for mill employees is also practically completed. The ore is being hauled by Best tractors and trailers, as the grade near the mine is too steep for trucks.

Rochester—Ernest F. Helliere states that Boston capitalists with whom he is associated are to erect a 100-ton custom mill this spring at the mouth of Limerick Canyon in the Rochester mining district. This will result in opening up several smaller properties where the ore is of too low grade to ship.

OKLAHOMA

Joplin-Miami District

Douthat—The Miami Metals Co. has started drilling out its lease near Douthat and plans rebuilding the mill that was lost by fire some months ago if the drilling campaign results satisfactorily.

Alfred Hare and associates, of Oklahoma City, have taken over the Greening mill and lease, located southeast of Douthat, and have renamed it the Bull Moose. The mine formerly was handicapped by heavy water, but the campaign of the Quapaw Drainage Co. has eliminated this trouble.

SOUTH DAKOTA

Homestake Dropping 740 Stamps—Keystone Merger Pending—Trojan Increases Wages

Lead—The Star mill of the Homestake company has been placed in commission and adds 200 stamps to the 540 already dropping. The remaining 280 will be utilized as soon as labor becomes available, which it is hoped will be within the next few months. Since the increase in wages effective March 1, miners have become more plentiful and in all probability this company will return to a normal production before the middle of the year. The water in the mine has been lowered to a point below the 1,250-ft. level.

Galena—The New Silver Queen mine is making regular shipments of lead-silver ores to the smelter. Other properties in the district have been leased, and with the present high price of silver this camp will be active this year.

The Richmond-Sitting Bull mine is being thoroughly sampled and there is a deal pending looking to a merger of the larger properties, with a view to operation on a large scale.

The Rattlesnake Jack is still idle but will begin active work as soon as labor becomes available. This property is equipped with a modern cyanide plant, and when last operated, in 1916, was treating gold ore of good grade.

The differences which caused the shutdown have been adjusted.

Keystone—Options on all the larger properties in this district have been secured and are held in escrow in the local bank. As soon as the terms of the contracts are fulfilled the properties will be merged into one large concern and operated on a large scale. It is expected that work will be started early this year. Among the properties included in the merger are the Columbia, Holy Terror, Keystone, Bismarck and Bullion.

Deadwood—Despite press dispatches to the effect that the U. S. Assay Office at Deadwood would be discontineud, the following message from Congressman Gandy, to the local press has been received: "The House, in committee of the whole, on consideration of the legislative, executive and judicial appropriation bill, adopted my amendment making provisions for the Deadwood Assay Office for the fiscal year of 1921."

The Trojan Mining Co. voluntarily increased wages of all employees effective March 1. Underground miners now receive $5 per eight hour shift while other underground labor receives $4.50. Surface and mill labor received the same proportionate increase.

UTAH

To Resume Hauling Ore Between Wasatch and Alta

Salt Lake City—The Little Cottonwood Transportation Co., which owns a narrow-gage railroad running between Wasatch and Alta up Little Cottonwood Canyon, expects to resume operations for the summer hauling season about the middle of March. A large tonnage of ore is awaiting shipment at Alta. The South Hecla, which has been the largest shipper, will supply its regular tonnage. The Columbus-Rexall is reported to have its bins full and considerable ore blocked out; the Emma Silver Mines expects to furnish shipments from its new strike on the 100 level below the Bay City tunnel. At the Sells the recent strike is opening up in such a way as to promise ore for the railroad. The Alta Consolidated and Michigan Utah will also contribute.

WASHINGTON

Gladstone Shipping Lead Ore—La Flour Copper Resumes—Oroville District Active

Northport — The Gladstone Mining Co. is taking advantage of the snow to sled out several shipments of sorted lead ore. This is galena and cerrusite and occurs in a large chimney in limestone.

Chewelah—Several carload shipments of magnetite are being made from the Roosevelt mine near Chewsaw, northern Okanogan County, to the plant of the Northwest Magnesite Co., for use in the manufacture of ferro-magnesite.

Danville—The La Flour Mountain Copper Co., operating the Comstock and Walla Walla groups on La Flour Mountain, has resumed operations with a crew of ten men. The company plans to install a small air compressor, hoist and auxiliary machinery.

Oroville — The Oroville - Nighthawk district in northern Okanogan County is one of the most active districts in the state. The Oroville Commercial Club is arranging a series of automobile excursions that their members may become better acquainted with the mining development in the district.

CANADA

British Columbia

Mayo—News of the silver discoveries in the Mayo district, situated close to the Stewart River and about 200 miles southeast of Dawson, has been brought south by J. E. Binet, a miner who went to the Yukon in 1895. Assays of ore taken from this section, he states, run between $150 to $1,500 a ton and surface indications and development as far as it has gone appear to indicate large deposits. The finds have been made above the timber line and Mr. Binet affirms that the Yukon Gold Co. has bought the most promising claims, paying approximately $45,000. Representatives of the company are spending the winter at the camp and at present ore is being brought out by sleds to the banks of the Stewart River, 40 miles away, thence to be shipped to White Horse and in the spring to be sent, probably, to the Anyox smelter. Thomas Aitken, who staked the Silver King in that district two years ago, is said to have reaped a modest fortune already from 3,500 tons of picked ore. Work is in progress on claims situated on Kino Hill, Haldane, Patterson and Cameron Mountains and it is estimated that there are about 165 miners in the district this winter.

Trail — The Consolidated Mining & Smelting Co. of Canada, Ltd., has declared a dividend of 2½ per cent on its paid-up capital stock for the quarter ending March 31, 1920, being at the rate of 10 per cent per annum. This dividend, which is No. 36, is payable April 1, 1920, to shareholders of record at the close of business on March 10, 1920.

Shipments to the Consolidated M. & S. Co.'s smelter at Trail during the week ended Feb. 29 are given in the following table:

Mine	Location	Gross Tons
Emma	Coltern	188
Iron Mask	Kamloops	49 C
Josie	Rossland	662
Molly Gibson	Kitto Ldg	156
Nor'n Sta.	Kimberly	34
Paradise	Athalmer	45
Ptarmigan	Athalmer	52
Rossland Properties	Rossland	1,234
Rambler Cariboo	Rambler	83 C
Republic	Slocan City	19
Standard	Silverton	348 C
Sally	Beaverdell	33
Sullivan (zinc)	Kimberly	2,906
Sullivan (lead)	Kimberly	195
Total		6,004

Ontario

Cobalt—The annual report of the Temiskaming for the year ended Dec. 31, 1919, shows a production of 243,036 oz. as compared with 420,078 the previous year, and is the smallest in the company's history. The mill ran only 43.8 per cent of the possible running time. Operating profit was $31,996. The surplus is $864,016 a decrease of about $58,000.

President Bickell, at the annual meeting of the Temiskaming, stated that there was no assurance of continued dividends. While the company has found new ore, its distribution is very erratic.

It is understood that the Hudson Bay Mines of Cobalt will not advance any more money to the Dome Lake property in Porcupine, in which it holds a large stock interest. The Dome Lake has been the most "financed" property in northern Ontario, and from the time of its first organization, it has been a succession of reorganizations and refinancing. For the last few years the Hudson Bay Mines' treasury has nobly stood the brunt of these attacks, but apparently the directors are getting tired, or the money is running short.

Developments at the University property of the La Rose continue satisfactory and an ore shoot is being opened up at the 90 and 145-ft. levels. At the 90-ft. level there is a width of 20 ft. of payable ore.

The Coniagas, which recently bought the Trethewey, will not be in a position to mine ore till next summer.

The Peterson Lake and the Dominion Reduction company are negotiating for the treatment of the old tailings of the Dominion Reduction mill. By the judgment of the court part of the tailings belong to the mill and part to the Peterson Lake company on whose ground they were deposited.

The McKinley Darragh has declared the regular quarterly dividend of 3 per cent payable April 1.

The annual report of the Northern Ontario Light & Power Co., which serves Cobalt with compressed air and electricity, show net profits of $573,401. This is a decrease of $75,000 as compared with the previous year and is due to the strike. The company expects increased revenue this year from anticipated developments in the different mining camps.

The Cobalt Miners' Union Hall is being offered for sale. Following the strike the organization has gone to pieces and this latest move probably marks the passing from the camp of Cobalt of the International Union of Mine, Mill and Smelter Workers.

The annual report of the Lake Shore Mines for the year ended Nov. 30, 1919, showed a total production of $294,513, as compared with $321,645 for the previous year. The net profits were $38,273. Dividends of $100,000 were paid, and there was a deficit of $47,000. Operations at the property were greatly handicapped by the strike, which lasted for four months. Recovery per ton was $24.67, and 11,907 tons was milled. Although several ore shoots of milling grade have been opened, no ore has been actually blocked out, and no estimate of ore in place is given. Ore

broken in the stopes amounts to 6,035 tons, averaging $32.60 per ton, or a total of $185,941.

Porcupine—During the year ended Dec. 31 last, the Hollinger Gold Mines produced gold and silver bullion to the value of $6,722,266, an increase of $1,000,000 over the preceding year. The net profit was $2,321,290, a decrease of $267,500. This decrease is accounted for by capital and deferred development written off, and by a greater allowance for depreciation. The company paid over $1,700,000 in dividends. The surplus is $5,738,053 and total assets $27,644,392. The mill treated 711,822 tons of ore, of an average grade of $9.73, and recovered an average of $9.44 per ton. The mill ran 70.5 per cent of the possible running time, and the daily average tonnage treated was 1,950 tons. The ore reserves are estimated at $39,928,430, a decrease of about $1,000,000 from the preceding year. The decrease in ore reserves is due to the fact that under the present uncertain operating conditions the management does not consider it advisable to develop some of the lower-grade orebodies.

The Vipond-North Thompson mine at Porcupine is still closed down, although efforts are being made to have it reopened. The property is an amalgamation of the Vipond, owned by American interests, and the North Thompson, owned by English interests, and there seems to be a lack of co-operation between the two interests. The property is equipped with a 100-ton mill, and was a consistent producer before the shut-down due to war conditions.

It is stated that the consulting engineer of the Davidson reports an increase of approximately $1,000,000 in ore reserves. The Davidson has the happy status of being submerged in optimism.

Shareholders of the Dome Extension have been advised that the directors have granted an extension of the option for six months from Mar. 15, to the Dome Mines. Due to a shortage of labor and various mishaps at the Dome, much less work was accomplished than was originally planned, and the information available is not sufficient to enable the Dome officials to advise upon the exercising of the option. A considerable body of ore of a grade of about $5 a ton has been developed, but only on one level. The Dome asked for a year's extension, but was only granted six months. The present option is on an exchange of shares, on the basis of 30 shares of Dome Extension for one of Dome. Before that, another option had been granted on a basis of 50 to 1. During the course of a few more options, an exchange on the basis of one for one can, no doubt, be arranged.

South Lorrain—The Associated Gold Mines, of Western Australia, is preparing to operate the Keeley mine. It has purchased the Trethewey stamp mill. The Trethewey property, including the mill, was recently purchased by the Coniagas. Previous operations have not proved profitable because, although a substantial quantity of ore was mined, the cost of transportation for milling at a distance made it necessary to restrict shipments to high-grade ore. It is believed that with the acquisition of a mill no difficulty will be experienced in treating a large amount of medium-grade ore at a profit.

Larder Lake—A report from the Associated Gold Fields of Larder Lake shows a large tonnage of ore, the width of the body varying from 50 to 250 ft., at the 500-ft. level. The ore averages $11.92 per ton. Very little credence is given to this statement.

Kirkland Lake—The Wright-Hargraves mine of Kirkland Lake will start work on a 200-ton mill, as soon as spring opens. The treatment will consist of fine grinding and cyaniding.

The Tough Oakes mine will remain closed for the present until the proposed merger with the Sylvanite and the Burnside is completed.

Quebec

J. A. Jacobs, who is largely interested in the Jacobs Asbestos Co., one of the principal companies of the Thetford district of Quebec, has made an interesting offer for a large block of Black Lake Asbestos & Chrome Co.'s bonds and shares. He offers to purchase $200,000 worth of bonds at 50, $300,000 preferred at 25 and $700,000 common at 12; the time limit for the deposit of bonds and shares is Mar. 29. Bids on Mar. 6 were: Bonds 44, preferred 23½, common 11. A year or so ago the bonds were selling at about $20, preferred at $8 and common at $3.

The Black Lake was one of the big mergers of a number of years ago in the asbestos district. The promotion was put through with little regard for financial and economic soundness, but with the large acreage and unlimited optimism, the issue was successfully floated. After only a comparatively short period of operating, under the new conditions, the company came a bad cropper. It was reorganized and managed to struggle along until the war, when the high prices for chrome and asbestos put it on its feet. Profits for last year were $155,129. Net current assets over liabilities were $261,500. The company has the largest acreage of chrome lands of any corporation in the country, and has one particularly interesting deposit in which there is a considerable tonnage of chrome ore, of a good grade, developed.

Chronology of Mining, February, 1920

Feb. 1—Utah-Apex Mining Co. resumed milling operations.—Lake Superior mining companies advanced wages 10 per cent.

Feb. 2—Verde Tunnel & Smelter R.R. began its service to Clarkdale, Ariz.—Trial opened at Tombstone, Ariz., of 210 men charged with kidnapping in connection with the deportations at Bisbee on July 20, 1917.—Empire of India adopted a new gold exchange standard of Rs 1 = 11.30016 grains fine gold.—Oil Lands Leasing Bill (S. 2775) agreed to by House and Senate conferees; this bill was adopted by the House Feb. 10, by the Senate Feb. 11, and signed by President Wilson Feb. 25.

Feb. 6—Republic Mining & Milling Co. completed sale to the Empire Zinc Co., Hanover, N. M.—Hunt Mining Co.'s mill near Picher, Okla., destroyed by fire.

Feb. 8—Tonopah and Divide Mine Operators' Association discontinued the daily bonus of 50c. to its men, as the company store was judged in full and satisfactory operation.

Feb. 9—Spitzbergen transferred to sovereignty of Norway by a treaty signed at Paris, the United States being among the signatories.

Feb. 10—Trials at Tombstone, Ariz., resumed.—Bingham, Utah, underground miners struck for an 8-hour day "collar to collar" and a wage of $6 per day; Park City miners voted against this strike.—Copper Range Co.'s Baltic mine resumed shipping ore from its No. 2 shaft, put out of commission by a cave-in on Dec. 4, 1919.

Feb. 13—Tonopah-Divide mine operators' offer of additional 50c. per shift and other concessions was accepted by the miners' unions, which signed a new agreement to run one year.—Wilson Welsh Adams, superintendent of Providencia mine, Zacatecas, Mexico, was kidnapped at Avalos, Mexico.

Feb. 14—Tonopah mines and mills resumed work under the new wage agreement, which is retroactive to Feb. 8.—W. W. Adams released by his Mexican kidnappers.

Feb. 16-19—American Institute of Mining and Metallurgical Engineers held its annual meeting at New York City.

Feb. 17—Herbert Hoover spoke on national questions, at the annual banquet of the A. I. M. E.—Coeur d'Alene operators granted 50c. increase in wages, effective Mar. 1.

Feb. 19—A mass meeting of engineers in New York approved the creation of a Federal Department of Public Works.

Feb. 20—Rear Admiral R. E. Peary died at Washington, D. C.

Feb. 23-28—Idaho School of Mines at Moscow, Idaho, held a flotation conference.

Feb. 25—Oil-Land Leasing bill (S. 2775) was signed by President Wilson at 3 p.m.—Chino, Ray Consolidated and Nevada Consolidated copper companies announced reductions in size of dividends.

Feb. 26—Washington advised that Barry Hogarty, superintendent of the American Metals Co.'s smelter, Durango, Mexico, was seized by Mexicans and held for ransom; he was promptly released.

MEN YOU SHOULD KNOW ABOUT

J. Murray Riddell has gone to Louisiana on professional business.

L. D. Cooper, chief engineer for the E. J. Longyear Co., was in New York recently.

Forest Rutherford, consulting metallurgical engineer, 120 Broadway, New York City, has returned from an extended trip through the Southwest.

Barry Hogarty, superintendent at Mapini for American Metals Co., and kidnapped by Mexicans on Feb. 23, returned safely to the mine office on Feb. 24.

C. W. Wright, who spent January in America on business, returned to Italy early in February. He has established an engineering office at 28 Via Parlamento in Rome.

P. B. McDonald, assistart professor of English, New York University College of Engineering, has been engaged by the Western Electric Co. to give a series of twenty-four evening talks to engineers on the use of English.

Frank H. Sistermans, mining engineer, of New York City, has left for Mexico, where he will examine various mining properties in the interests of eastern clients. His address is care of Apartado 733, Mexico City, Mexico.

John Jacobs, chemist and metallurgist for Mohawk and Wolverine companies at Gay, Mich., died suddenly of influenza March 4 at the age of 40. Before association with the Yandell mines he was employed by the Quincy company.

Arthur L. Walker, professor of metallurgy at Columbia University School of Mines, is delivering, by invitation, a course of lectures on non-ferrous metallurgy before classes of the new engineering school at Harvard University. The first lecture was delivered the middle of February.

Bulkeley Wells, President of the American Mining Congress and manager of several large mining companies in Colorado and other western states, left Denver on an inspection trip the first of March. After visiting properties in California, Nevada and Utah, he will return to Denver the latter part of the month.

OBITUARY

Ray A. Corcoran, superintendent for the Santa Gertrudis Mining Co., Pachuca, state of Hidalgo, was shot and killed Feb. 28 in his office by a clerk.

Henry Pope Lowe, mining engineer of Denver, Col., died March 3. Mr. Lowe took an active part in the development of Colorado's mineral resources, and was particularly interested in the mines and mining finance of Boulder and Gilpin counties of that state.

George W. Bissett, mining engineer, died at Haileybury March 4 from pneumonia, aged thirty-eight. He was a graduate of Toronto University and of the School of Practical Science and a specialist in the treatment of gold ores. Mr. Bissett was mine manager on Block B of Associated Goldfields at Larder Lake.

Fred Lenten, in charge of Amygdaloid shafts 13, 14 and 15 of Calumet & Hecla Mining Co., died March 1 in Arizona. He was born in Cornwall and worked his way from the bottom up. Lenten was at the Tamarack and Trimountain before going to the Calumet & Hecla company. He was a fine type of the successful practical miner.

George A. Kernick, mining man and president of four Tonopah companies, died at Alameda, Cal., Feb. 14. He was a native of Lucan, Canada, where he was born forty-seven years ago. His experience embraced British Columbia, Alaska, California, and Nevada, notably the latter state. He discovered the Hasbrouck mine, at Goldfield, Nev., in 1902.

Joseph M. Flannery, pioneer in the development of the vanadium steel industry, died of pneumonia at Pittsburgh, Pa., on Feb. 18. He had been in poor health for several months. Besides his pioneer work in securing the great Peruvian vanadium deposits for American steel workers, his investigations brought him to radium-bearing deposits in Colorado. These he developed through his Standard Chemical Co., which is now one of the largest radium producers. Mr. Flannery was fifty-two years old and and a lifelong resident of Pittsburgh.

William H. Sirdevan, chief mine engineer of the staff of the United Verde Copper Co. at Jerome, Ariz., died of pneumonia in San Francisco on Feb. 15. Mr. Sirdevan was a graduate of Yale and long on the staff of Spurr & Cox, Inc. Later he was on the examining and the operating staffs of Tonopah Mining Co., of Nevada. In the execution of his work Mr. Sirdevan spent much time in Mexico, Nicaragua, and Colombia. His last work for the Tonopah company was assisting M. B. Huston in the development of the Rosita mine, in Nicaragua. Later he joined H. Dewitt Smith, superintendent of mines at the United Verde Copper Co.'s property, and was there when influenza carried him away. He passed through a very severe attack of influenza the previous winter and had not entirely regained his strength at the time of his last illness. While at Jerome Mr. Sirdevan collaborated with Mr. Smith in the preparation of an article on "Mining Methods and Costs at the United Verde," submitted for publication by the American Institute of Mining and Metallurgical Engineers. Mr. Sirdevan's many friends will feel his loss sincerely; and the mining profession is poorer by an able engineer and a gentleman of high character.

SOCIETIES

The chairman of the Pan-American Federation of Labor has summoned the **Third Pan-American Labor Congress** to meet at the City of Mexico, July 12, 1920.

Arrangements are beginning to take definite form for the **International Mining Convention** which embraces the Northwestern States, Alaska, and British Columbia, to be held in Seattle April 7 to 10 inclusive. Dean Henry Landes, chairman of the program committee, is arranging a program that will prove attractive to prospectors, mining engineers, manufacturers of mining machinery, and all mining men in general. Among the papers on the program are the following: "Petroleum Sources of Power," by C. P. Bowie, U. S. Bureau of Mines; "Coal Resources," by Prof. Joseph Daniels, Washington College of Mines; "Iron and Steel," discussions by William Sloan, Minister of Mines of British Columbia and by Bart L. Thane, of San Francisco; "Copper," by W. C. Kerr, superintendent of the Tacoma smelter; "Lead," by Stanley Easton, of Kellogg, Idaho; "Electro-Chemistry and Metallurgy," by O. C. Ralston, superintendent of the Seattle Station of the U. S. Bureau of Mines; "Present Problems of the Mining Industry," by Dorsey Lyon, U. S. Bureau of Mines. Other speakers expected are Herbert Hoover, Horace V. Winchell, T. A. Rickard, George Otis Smith, and Wakefield Williams, superintendent of Granby Smelting & Refining Co., Anyox, B. C. Discussion in round-table conferences will be led by the following: "Nitrates," Prof. H. K. Benson, University of Washington; "Phosphates," A. E. Wells, chief of the Salt Lake Station of the Bureau of Mines.

INDUSTRIAL NEWS

Edwin E. & R. L. Chase, mining and geological engineers, announce that they have changed their address to 207 Colorado National Bank Building, Denver, Col.

The Mines Handbook is reported by its editor, W. H. Weed, as now on the press, and copies are expected to be available about April 1. This new edition has been advanced in price to $15 a copy in the United States and to $16.50 for Canada and abroad.

F. C. Thornley & Co., constructing and consulting engineers, 31 West 43d Street, New York City, announces that A. T. Shurick became associated with and elected vice-president of the company on Feb. 6. Mr. Shurick, who was recently of the business staff of "Coal Trade Journal," is a graduate of the Virginia Polytechnic Institute

NEW PUBLICATIONS

The Copper Districts of Ray and Miami, Arizona. By Frederick Leslie Ransome. Professional Paper 115, p. 178. U. S. Geological Survey, Washington, D. C., 1919.

This is an admirably organized report on an important mining district. Grateful features are the preliminary outline, the summary of "practical deductions," and the glossary of technical terms, as well as many other methodical and systematic characteristics.

The oldest rocks are pre-Cambrian schists of both sedimentary and igneous origin. On the old erosion surface of these schists rests over a thousand feet of Cambrian rocks, mainly quartzites; above come probable Devonian and then certainly Carboniferous limestones. Uplift, erosion, and the intrusion of diabase sills followed. Subsequently came andesite eruptions, followed by the intrusion in the Tertiary period of granitic and dioritic rocks. Mineralization (or "metallization") followed this intrusion, producing the primary lean copper ores from which later secondary enrichment by surface waters produced the present ores of Ray and Miami. Subsequently there was a long period, reaching down to the present, of erosion and the deposition of terrestrial ("continental") conglomerates, with attendant continued faulting, and a flow of lava (dacite) in the late Tertiary.

The main ranges are believed to have been determined by block faulting, although the details of topography are due to erosion.

The amount of disseminated copper ore originally present in both districts was 260,000,000 tons, containing between 1.5 and 2 per cent of copper. The process of enrichment is described as probably cyclic rather than progressive.

In ascribing the primary ore deposition to the granitic intrusion, Ransome follows the conclusion arrived at by Spurr, in the report and map made for the Ray Consolidated Co., by Spurr & Cox, Inc., and does not follow his conclusion as to the connection of the ore with the diabase intrusion, as stated in his report on the Globe area, within this same district.

For conscientious thoroughness, for many-sided investigations, and for careful and intellectually independent reasoning and conclusion, this report is in every respect admirable. In geological literature, carefulness may sometimes develop into over-cautiousness, and possibly in a type of mild intellectual myopia which distorts the obvious but dimly discerned facts and conclusions into objects of suspicion. The Pegasus, in this event, sometimes balks at the nearest ditch; or, on the other hand, essays a ditch which proves wider than judged, and lands in it.

We question the conclusions, on the basis of data presented, as to the origin of the *relief* of the ranges as due to faulting, rather than differential erosion. We regard the question, on the data presented, as absolutely open. The national geologic mind has long ago realized that a mountain range initiated by folding may owe its relief to erosion, whether its structure be anticlinal or synclinal, and that proof must be sought in each case; but it has been unable to realize the same conception for ranges initiated by faulting. The data actually observed and recorded in the text and sections in this report indicate relief due to erosion.

Considerable discussion is given to the important fault running close to Mineral Creek, described by Spurr, and recognized by subsequent geologists. Ransome's map and cross-sections show this fault (Pl. XLV) as a heavy and important one; but in his text he argues against its importance. In conclusion we must still take space to mention the excellent chapter on Mineralogy, with its beautiful illustrations of malachite and chrysocolla. Alunite, first called forcibly to the attention of mining geologists by Ransome at Goldfield, he finds sparsely at Ray.

J. E. S.

Joint Report Upon the Survey and Demarcation of the International Boundary Between the United States and Canada Along the 141st Meridian From the Arctic Ocean to Mount St. Elias. By W. F. King and J. J. McArthur, for Great Britain, and O. H. Tittman and E. C. Barnard, for the United States. Two volumes, cloth, with illustrations and maps. Text, pp. 305, 9 x 12; maps, 38 sheets, 19 x 28. Published by The International Boundary Commission, Washington, D. C., 1920.

This monumental work represents the seven years' labor of parties numbering on an average about seventy men, who were engaged in delineating and marking the Alaska-Yukon boundary. The particularly arduous character of the work and the success with which it was accomplished should be an inspiration to all surveyors. The distance covered was slightly over 1,000 miles, much of it over the most difficult country—muskeg and mosquitoes in the north and rugged mountains and glaciers to the south. A twenty-foot skyline was opened along the boundary through all timber encountered, which should be plainly discernible for many years. Topographic maps of the country for approximately two miles on each side of the line were drawn, the scale being 1 to 62,500 and the contour interval, 100 ft. These are published together in one volume and are beautifully executed.

The volume which carries the text matter contains the story of each season's work, the positions of monuments, descriptions of triangular stations, a history of early explorations, and, in short, reference is made to all facts of interest in connection with the expeditions. A large number of as excellent arctic pictures as one could wish to see, combined with attractive typography, make this a work to appeal to anyone, even apart from its scientific value. Our four-year old son spent a solid hour looking at it last Sunday afternoon; a book that can command this attention is of considerably more than ordinary interest. E. H. R.

Hendricks' Commercial Register of the U. S. for Buyers and Sellers. 28th Annual Edition, 1919-1920. Cloth; 2,541 pp, 7½ x 10; S. E. Hendricks Co., Inc., New York.

This book, two months overdue on account of the printers' strike, is of value chiefly to sales and purchasing departments, as it gives the names of the manufacturers of over 18,000 different products. Another valuable list gives the manufacturers of articles sold under various trade names, though this does not seem to be particularly complete from a metallurgical standpoint. The name of a manufacturer of Hancock jigs is, for example, given, but Harz and Woodbury jigs are not covered. We did, however, find the name of the concern which manufactures Griffin mills, a question which we were recently asked. The various manufacturers listed are also arranged alphabetically, with their addresses. The uses of the volume are evident, and, as far as we know, it is as complete a book as any which attempts to cover the mining and metallurgical field.

E. H. R.

A Handbook of Petroleum, Asphalt and Natural Gas. By Roy Cross. Limp cover; 5 x 7½; pp. 496, illus. Published as Bulletin No. 15 by Kansas City Testing Laboratory, Kansas City, Mo., 1919.

This is a handbook of the conventional kind, which should be found particularly useful by those who are concerned with the refining and marketing of petroleum. Scant space is given to geology and mining. The first hundred pages are devoted largely to statistics regarding the companies operating in the various American and Mexican districts. The remainder of the book is a complete description of the apparatus and methods used by the petroleum chemist and investigator. The uses and specifications for many petroleum products are given. The index appears to be excellent. E. H. R.

THE MARKET REPORT

Published simultaneously in San Francisco and mailed from there to our Western subscribers as a special service pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

March	Sterling Exchange	Silver		March	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
4	346½	131⅜	84	8	355¾	128¼	78⅜
5	360¼	129⅜	77⅞	9	361	128	77⅝
6	360¾	128⅝	78⅞	10	370	127	75

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Daily Prices of Metals in New York

March	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
4	18.35@18.45	61	61¼	9.25@9.40	9@9⅛	8.55@8.65
5	18.35@18.45	62½	63	9.25@9.50	9@9⅛	8.60@8.70
6	18.35@18.45	62½	63	9.25@9.50	9@9⅛	8.50@8.60
8	18.30@18.45	61	61@61½	9.25@9.50	9@9⅛	8⅜@8.50
9	18.20@18.35	59¼	60@60½	9.25@9.50	9@9⅛	8.50@8.55
10	18.15@18.25	62	63½	9.25@9.50	9@9⅛	8.65@8.75

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

March	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
4	116¾	120½	127	397	403½	47¾	50	57	60½
5	114¼	117¾	122	393	396¼	48	50¼	56	59¼
6	....	....	....	....	....	....	....	....	....
8	111¾	115¼	121	386	391	50	52¼	52	55½
9	106	109	120	372	376	50¼	53	54	57½
10	111	114	118	383	389	50¼	53	57	59¾

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York, March 10, 1920

The feature of the week was the spectacular, sudden slump in metals in the London market, which was followed by a partial rally. This was caused by the British Government demanding payment from metal dealers for government war stocks of metals, previously disposed of to them. As the fiscal year of the government closes March 31, it desired to present as good a financial statement as possible. In order to pay, dealers had to dispose of some of their stock of metals for what they could realize. The effect was felt most in zinc, to a less degree in lead, and to a minor degree in copper.

The price of foreign exchange continued to rise, which also naturally had a depressing effect on London prices. Transatlantic freights were unchanged and transpacific rates remained at $12 from Hongkong and Kobe to San Francisco.

Copper

The copper market is quiet. Large producers are selling between 18¼c. and 18⅜c. for nearby delivery (March, April, and May), the greater amount of sales being made at 18⅜@18½c. In the outside market, however, copper in considerable amounts has been sold at down to 18¼c., and in smaller lots as low as 18c. There is plenty of copper to be had at the average figures quoted in our tables. Though the average of all sales for the week is about uniform, there developed during the week a wider range between the prices of producers and the outside market, evincing a tendency for the copper price to sag in spite of the efforts of the producers to sustain the market. On the whole, the copper market may be said to be somewhat depressed.

Tin

Tin has been quiet so far as actual consumers are concerned, but has been active on the London market, where speculation is brisk, and where on Monday the price for standard grades declined.

Straits tin for future delivery was quoted as follows: March 4, 63@63¼c.; March 5, 64@64¼c.; March 6, 64@64¼c.; March 8, 63@63¼c.; March 9, 62@62¼c.; March 10, 64½c.

Electrolytic tin was quoted as follows: March 4, 62c.; March 5, 62c.; March 6, 62c.; March 8, 61⅜c.; March 9, 60¾c.; March 10, 63¾@64c.

Arrivals of tin during the week have been March 3, 250 tons from Singapore; March 6, 100 tons from Australia; March 8, 100 tons from London; March 9, 50 tons from London, and 225 tons from Liverpool.

Lead

The demand for lead during the week has been good, and the consumption has been large, and in it numerous industries have shared. Much metal has been consumed by corroders and makers of white lead, cable for telephone work, and in mixed metals. Considerable metal has been bought by the various cartridge manufacturers, whose products have apparently been in increased demand for sporting purposes. Tinfoil makers have been consumers of lead during the week. The A. S. & R. Co. advanced its price to 9¼c. New York on March 5, since which date trading in some quarters has been less active.

Zinc

The zinc market is normal and relatively active. Stocks are normal. On Monday the London market broke £4, and the break was reflected in New York, where the metal was sold as low as 8⅜c. in some quantity. The reason is explained in our preceding general summary. Since then the market has been recovering and the price has gone up as high as 8.75c., the situation today being fairly firm.

Altogether, a considerable business has been done during the week, and the sentiment is cheerful. In London zinc has rallied £2 since yesterday.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots.

Gold, Silver and Platinum

Gold was quoted in London as follows: March 4, 119s.; March 5, 114s.; March 6, 114s. 6d.; March 8, 115s. 6d.; March 9, 114s. 6d.; March 10, 111s. 9d.

Foreign Exchange. — Sterling exchange and German marks led in a sharp advance yesterday, sterling being quoted as high as $3.65 and marks advanced to 1.29c. Today, sterling reached $3.76½ and German marks are quoted at 1.55c. Francs closed on Tuesday at 13.75 to the dollar; Austrian kronen, 0.47c; Italian lire, 17.92; Spanish pesetas, 17.65; and Canadian dollars were accepted at about 11½ per cent discount.

Silver—The London market has been very erratic the last week, opening at 84d. and closing at 75d., due very largely to the violent fluctuations in sterling exchange. London still continues to receive supplies from the Continent, in the form of coin to be melted, in sufficient quantity to supply its local needs. The New York market has declined the last week in sympathy with lower quotations from London and on account of lessened demand from China buyers. The China banks have limited their orders since the Chinese New Year.

Corrected Circulation Statement received Feb. 28, 1920: The general stock of money in the United States on Feb. 1, 1920, totaled $7,762,854,277; of this $2,762,905,481 was gold coin and bullion, $284,784,505 in standard silver dollars, and $251,307,010 in subsidiary silver. The money in circulation on Feb. 1 was $5,864,171,213, or $54.94 per capita.

Mexican dollars at New York: March 4, 100⅜; March 5, 100; March 6, 99⅛; March 8, 99⅛; March 9, 98⅜; March 10, 97⅝.

Platinum—Market quiet, $140@$145 per oz.

Palladium—$130@$135 per oz. No movement.

Iridium—Quoted at $300. Scarce.

Aluminum—Ingot 33c. per lb. No change.

Antimony—Demand is fairly good, with supply of metal not so plentiful. Ordinary brands, both spot and futures, average about 11¼@11⅜c.; W.C.C., 11⅜c., and Cookson's spot, 14c.

Bismuth — Unchanged at $2.50 for 500-lb. lots.

Cadmium — Unchanged at $1.40 @ $1.50 per lb.

Nickel—Ingot, 43c.; shot, 43c,; electrolytic, 45c. Unchanged.

Quicksilver—Firmer at $89 per 75-lb. flask. San Francisco telegraphs $83, active.

Pyrites—Spanish pyrites is quoted at 16c. per unit for furnace-size ore, free from fines, c.i.f., Atlantic ports.

Sulphur—Practically no change has taken place in the situation of this mineral.

Chrome Ore—Indian chrome ore of good quality has been offered at prices ranging from 70 to 75c. per unit. The demand, however, is limited.

Manganese Ore — Some business is reported in India and Brazilian ore at 70c. per unit.

Molybdenum Ore—Little business being done. Prices range from 65 to 70c. for 85 per cent concentrates.

Tungsten Ore—The market is quiet, with Chinese ore selling at $6 per ton.

Feldspar—A continued active market for the last few months, combined with a series of unfortunate conditions, the latest being the severe weather, which has interfered with surface mining, has seriously crippled this industry. One large producer is refusing to consider any more contracts for the present, even at the Government price of $18 per ton. The nominal quotation of $13.50@$18 per ton, ground grade, f.o.b. Tennessee and New York, remains firm, although there has been no business, on a large scale, reported at these prices.

Graphite.—No. 1 crucible flake dropped 50 per cent following the armistice and has never recovered. Present quotations are: 86 per cent, 8c. per lb.; 88 per cent, 8½c. per lb.; 90 per cent, 9c. per lb.; 92 per cent, 9½c. per lb. delivered. Owing to reduced demand since cessation of the war, only four or five of the twenty or thirty Alabama mines are in operation and producing No. 1 flake. The companies which have developed, or are developing, a market for other than crucible graphite stand a better chance for permanency.

Uranium Ore (Carnotite) — $2.75 @ $3 per lb. of 96 per cent U_3O_8, minimum 2 per cent U_3O_8.

Vanadium Ore—$6 per lb. of 99 per cent V_2O_5 contained.

Ilmenite—2c. per lb. of 52 per cent TiO_2.

Rutile—11c. per lb. of 95 per cent TiO_2.

Zinc and Lead Ore Markets

Joplin, Mo., Mar. 6.—Zinc blende, per ton, high, $54.90; basis 60 per cent zinc, premium, $53.50; Prime Western, $52.50@$47.50; fines and slimes, $47.50 @$45; calamine basis 40 per cent zinc, $35. Average settling prices: Blende, $50.97; calamine, $38; all zinc ores, $50.92.

Lead, high, $105.70; basis 80 per cent lead, $105; average settling price, all grades of lead, $103.90 per ton.

Shipments the week: Blende, 9,884; calamine, 62; lead, 1,744 tons. Value, all ores the week, $686,080.

The drop in the foreign market in midweek was used to force the price down to $47.50 on several bins of ore. The advance in exchange that followed advanced ore prices to $50 basis, and was used today by sellers to demand a higher price, and it was returned to $52.50 for ore bought late today.

Blizzard weather suddenly thrust upon an unsuspecting section enjoying spring temperatures caused considerable damage by freezing pumps and water-supply pipes and retarded production. Private ownership of railroads has not yet been of benefit to the car situation. Rather, this week it was a serious setback, and the weather retarded loading the cars received.

Platteville, Wis., Mar. 6.—No open market sales of high-grade blende are reported, but contract sales approximated a nominal base of $52 to $54 per ton. Lead ore, basis 80 per cent lead, $104 per ton. Shipments for the week: Blende, 1,580; calamine, 120 tons. Year to date: Blende, 1,969; calamine, 720; lead, 1,425; sulphur ore, 106 tons. During the week, 373 tons blende was shipped to separating plants.

Iron Trade Review

Pittsburgh, March 9, 1920

The steel market is distinctly quieter, except in a few spots. This is as to the actual tonnage turnover. It is said that there would be a heavier turnover if the mills were willing to sell farther ahead, but there is a growing suspicion that if order books were wide open buyers would not be as ready to buy for third quarter as they have been for second quarter. It is stated that, as it is, the independents in many cases will have to carry a considerable tonnage over July 1. The Steel Corporation is booked rather fully in many quarters, not only through the third quarter but also for longer periods. This is a special case, of course, as the Steel Corporation adheres to the March 21 or Industrial Board prices, whereas all the independents are on higher levels.

Transportation conditions are improving, but slowly. In coal movement there is perhaps no improvement at all, the past fortnight having witnessed particularly extreme car shortages. Connellsville coke is moving a trifle better, and most of the steel mills that had accumulations of finished product are slightly reducing these tonnages.

Production continues to increase, despite various drawbacks. Pig-iron output in the country as a whole is now at 85 or 90 per cent of capacity, depending on the estimate that is made as to capacity, 43,000,000 to 45,000,000 tons, and steel production is at 85 per cent or perhaps a shade more. Spring weather will bring heavier production, both by the direct influence upon mills and by loosening up the railroads.

Pig Iron—The pig-iron market is distinctly quiet, and generally admitted to be less strong than a few weeks ago, though no actual recessions are recorded in prices except the recent decline of $1.50 in basic. An outstanding feature is the absence of premiums for prompt delivery, even the premium on foundry grade having recently come off. Never before has there been a high price for forward pig iron without there being a premium for prompt. Two lots of 200 tons each of bessemer iron were sold this week at the regular price of $42, Valley, and there have been a few odd lots of foundry iron at its regular price of $42. We quote: Bessemer, $42; basic, $41.50; foundry, $42; malleable, $43.25, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40.

Steel—Sheet bars have sold in small lots to the extent of 5,000 to 10,000 tons at $90, or $10 higher than the highest figure reported a week ago.

MINING STOCKS

Week Ended March 6, 1920

Stock	Exch.	High	Low	Last	Last	Div.
COPPER						
Adventure	Boston	*90	*90	*90		
Ahmeek	Boston	70	69	70	Dec. '19,	$1.00
Alaska-B.C.	N. Y. Curb	1½	1	1½		
Algomah	Boston	....	....	35		
Alloues	Boston	....	....	33	Mar. '19,	1.00
Anaconda	N. Y.	58⅜	56¼	58	Feb. '20,	1.00
Ariz. Com	Boston	12⅜	12	12¼	Oct. '18,	.50
Big Ledge	N. Y. Curb	7/16	3/8	7/16		
Bingham Mines	Boston	7	6¾	7	Sept. '19,	.25
Boston & Ely	Boston Curb	....	....	*55		
Butte & Bal	Boston	....	....	*30		
Butte & Lond	Boston Curb	*15	*10	†*10		
Calaveras	Boston Curb	....	....	1		
Calumet & Ariz.	Boston	62½	60	61½	Dec. '19,	.50
Calumet & Hecla	Boston	350	340	345	Dec. '19,	5.00
Calumet & Jerome	N. Y. Curb	....	....	1/16		
Can. Copper	N. Y. Curb	1 3/16	1⅛	1 1/16		
Centennial	Boston	14	14	14	Dec. '18,	1.00
Cerro de Pasco	N. Y.	48½	46	48½	Mar. '20,	1.00
Con. Aris	N. Y. Curb	1/8	1/8	1/16	Dec. '18,	.05
Con. Copper M.	N. Y. Curb	....	....	4		
Chile Cop	N. Y.	17⅛	16⅛	16¼		
Chino	N. Y.	34¼	32⅛	33⅛	Dec. '19,	.75
Cop. Range	Boston	42	41⅛	42	Dec. '19,	.50
Crystal	Boston Curb	*38	*33	†*33		
Crystal Cop (old)	Boston Curb	*9	*4	†*4		
Daly-West	Boston	4⅞	4⅛	4⅛		
Davis-Daly	Boston	10⅛	10	10⅛	Dec. '19,	.50
East Butte	Boston	13⅜	12⅛	13	Dec. '19,	.50
First Nat'l	Boston Curb	1⅜	1⅛	†1 1/16	Feb. '19,	.15
Franklin	Boston	3⅜	3¼	3⅜		
Gadsden Copper	N. Y. Curb	1¼	1¼	1¼		
Granby Consol	N. Y.	38	36½	37	May '19,	1.25
Greene-Can	N. Y.	33	32	33	Feb. '19,	1.50
Hancock	Boston	5	4⅛	4⅛		
Helvetia	Boston	3⅛	2⅞	3⅛		
Houghton	Boston Curb	*75½	*75	†*75		
Howe Sound	N. Y. Curb	4	3⅞	4	Jan. '20,	.05
Indiana	Boston	3/8	3/8	3/8		
Inspiration Con.	N. Y.	53⅞	51⅛	53⅜	Jan. '20,	1.50
Iron Cap	Boston Curb	11⅛	11	†11	Feb. '19,	.25
Isle Royale	Boston	31½	31	31⅛	Sept. '19,	.50
Jerome Verde	N. Y. Curb	....	....	1/16		
Kennecott	N. Y.	29¼	28⅛	29	Dec. '19,	.50
Keweenaw	Boston	....	....	1¼		
Lake Copper	Boston	3⅛	3⅛	3⅛		
La Salle	Boston	3	3	3		
Magma Chief	N. Y. Curb	¼	¼	¼		
Magma Copper	N. Y. Curb	37	35⅛	37	Jan. '19	.50
Majestic	Boston Curb	*23	*15	†*15		
Mason Valley	N. Y. Curb	2⅜	2⅛	2⅛		
Mass Con	Boston	4⅛	4⅛	4⅛	Nov. '17,	1.00
Mayflower	Boston	8⅛	8	8		
Miami	N. Y.	22⅛	21⅛	22⅛	Feb. '20,	.50
Michigan	Boston	6⅛	6⅛	6⅛		
Mohawk	Boston	63	62⅛	63	Feb. 20,	1.50
Mother Lode (New)	N. Y. Curb	5	5	5		
Nev. Con	N. Y.	15⅛	14	15	Dec. '19,	.37½
Nixon Nev	N. Y. Curb	16	14	16		
Nev. Douglas	Boston Curb	*17	*11	†*12		
New Arcadian	Boston	3 3/16	3⅛	3⅛		
New Baltic	Boston Curb	4	3	†3		
New Cornelia	Boston	20⅛	20	20⅛	Nov. '18,	.25
North Butte	Boston	16½	16	16½	Oct. '18,	.25
North Lake	Boston	....	....	*50		
Ohio Copper	N. Y. Curb	....	....	1/16		
Oneco	Boston Curb	*100	*60	†*60		
Ojibway	Boston	....	....	2		
Old Dominion	Boston	32	31	31⅛	Dec. '18,	1.00
Osceola	Boston	....	....	47	Dec. '19,	1.00
Quincy	Boston	60	58	58	Feb. '20,	1.00
Ray Con	N. Y.	19	17½	19	Dec. '19,	.50
Ray Hercules	N. Y. Curb	....	....	1½		
St. Mary's M. L.	Boston	48	46	48	Dec. '19,	2.00
Seneca	Boston	15	14⅛	15		
Shannon	Boston	1⅜	1⅛	1⅜	Nov. '17,	.25
Shattuck Aris	N. Y.	12	11⅛	11⅛	Jan. '20,	.25
South Lake	Boston	*90	*90	*90		
South Utah	Boston	....	....	*15		
Superior	Boston	....	....	5⅛	Apr. '17,	1.00
Superior & Boston	Boston	4⅛	4⅛	4⅛		
Tenn. C & C	N. Y.	10⅛	9⅞	10	May '18,	1.00
Trinity	Boston	2	1⅞	2		
Tuolumne	Boston	*85	*82	*85		
United Verd. Ex.	Boston Curb	39	36⅛	†37	Feb. '20,	.50
Utah Cop	N. Y.	71⅛	70	71⅛	Dec. '19,	1.50
Utah Con	Boston	8⅛	8⅛	8⅛	Sept. '18,	.25
Utah M. & T.	Boston	2⅛	2	2⅛	Dec. '17,	.30
Victoria	Boston	2⅛	2⅛	2⅛		
Winona	Boston	....	....	1⅛		
Wolverine	Boston	19⅛	17⅛	19¼	Jan. '20,	.50
LEAD						
Hecla	N. Y. Curb	4⅛	2 3/16	4⅛	Dec. '19,	.15
St. Joseph Lead	N. Y.	16⅛	15⅛	16⅛	Dec. '19,	.25
Stewart	Boston Curb	*18	*16	†*16	Dec. '15,	.05
Utah Apex	Boston	2⅛	2⅛	2⅛	Nov. '18,	.25

*Cents per share. † Bid price on Mar. 6.

Stock	Exch.	High	Low	Last	Last	Div.
ZINC						
Am. Z. L. & S.	N. Y.	20⅞	17⅞	20¼	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	56¼	51⅛	56¼	Feb. '20,	1.50
Butte C. & Z.	N. Y.	10⅛	9⅞	10⅛	Jul. '18,	.50
Butte & N. Y.	N. Y. Curb	1/8	1/8	1/8		
Butte & Superior	N. Y.	27⅛	25	26⅛	Sept. '17,	1.25
Natl. Z. & L.	Boston Curb	*9	*5	†*7	May '17,	.02
Success	N. Y. Curb	*7	*5½	*5½	July '16,	.03
GOLD						
Alaska Gold	N. Y.	2	1⅞	1⅞		
Alaska Juneau	N. Y.	2	1⅞	2		
Booth	N. Y. Curb	6	5	6		
Carson Hill	N. Y. Curb	25⅜	22	22		
Cresson Gold	N. Y. Curb	2	1⅜	1⅞	Dec. '19,	.10
Dome Ex	Toronto	*28½	*28	*28		
Dome Lake	Toronto	*9⅛	*7	*9⅛		
Dome Mines	N. Y.	13⅞	12	12⅞	Jan. '20,	.25
Goldfield Con	N. Y. Curb	*15	*12	*14	Dec. '19,	.05
Hedley	Boston	....	....	4½	June '19,	.10
Hollinger	Toronto	6.75	6.50	6.50	Feb. '20,	.05
Homestake	N. Y.	....	....	61	Feb. '20,	.50
Kewanas	N. Y. Curb	*4	*3	*3		
Kirkland Lake	Toronto	*72½	*71½	*72½		
McIntyre Porcupine	Toronto	2.07	2.05	2.07	Jan. '20	.05
Silver Pick	N. Y. Curb	*21	*17	*20		
Teck-Hughes	Toronto	*18	*16½	*16½		
United Eastern	N. Y. Curb	4	3⅛	3⅛	Jan. '20,	.21
West Dome	Toronto	*8⅛	*8⅛	*8⅛		
White Caps	N. Y. Curb	13	11	12		
Yukon Gold	Boston Curb	1⅛	1⅛	†1⅛	June '18,	.02½
SILVER						
Adanac	Toronto	*3½	*3½	*3½		
Bailey	Toronto	*5⅛	*5⅛	*5½	Apr. '16,	.05
Beaver Con	Toronto	*63½	*62½	*63		
Coniagas	Toronto	....	....	3.00	Nov. '19,	.12½
Crown Reserve	Toronto	*38½	*37	*37½	Jan. '17,	.05
Hargraves	Toronto	*3⅜	*3⅜	*3⅜		
Kerr Lake	Boston	4	3⅞	3⅞	Sept. '19,	1.00
La Rose	N. Y. Curb	⅜	5/16	⅜	Apr. '18,	.02
McKinley-Dar	N. Y. Curb	63	61	61	Jan. '20,	.03
Nipissing	N. Y. Curb	11⅛	10⅜	11⅛	Jan. '20,	.50
Ontario Silver	N. Y.	8⅛	7	8	Jan. '19,	.50
Ophir Silver	N. Y. Curb	1⅛	1	1⅛		
Peterson Lake	Toronto	*21½	*20⅜	*21	Jan. '17,	.01½
Sil. King Aris	N. Y. Curb	1/16	1/16	1/16		
Temiskaming	Toronto	*43½	*43⅜	*43½	Jan. '20,	.04
Trethewey	Toronto	*46	*45½	*46	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*3⅛	*2	*3⅛		
Batopilas	Boston	....	....	1⅛		
Bost. & Mont.	N. Y. Curb	*65	*60	*63		
Cashboy	N. Y. Curb	*8⅛	*7⅛	*8		
El Salvador	N. Y. Curb	3	2⅞	2⅞		
Goldfield Merger	N. Y. Curb	*4	*3⅛	*4		
Jim Butler	N. Y. Curb	*25	*23	*24	Aug. '18,	.07
Jumbo Extension	N. Y. Curb	*9	*6	*9	June '16,	.05
Louisiana Con	N. Y. Curb	1/16	1/16	1/16		
McNamara Cr	N. Y. Curb	*1/16	*1/16	*1/16		
Nev. Packard	Boston Curb	*25	....	....	Apr. '19,	.02
Rochester Mines	N. Y. Curb	....	....	*18	Oct. '18,	.02
Tonopah-Belmont	N. Y. Curb	2⅛	2⅛	2⅛	Jan. '20,	.05
Tonopah-Divide	N. Y. Curb	2 1/16	1 15/16	2⅛		
Tonopah Ex	N. Y. Curb	2⅛	2 1/16	2 1/16	Jan. '20,	.05
Tonopah Mining	N. Y. Curb	2⅛	2 1/16	2 1/16	Oct. '19,	.15
West End Con	N. Y. Curb	*1⅛	*1⅛	*1⅛	Dec. '19,	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*36	*32	*36	Jan. '20,	.01
Fed. M. & S.	N. Y.	....	....	13⅜	Jan. '09,	1.50
Fed. M. & S. pf.	N. Y.	30	29	30	Dec. '19,	.50
Iron Blossom	N. Y. Curb	⅜	⅜	⅜	Jan '20.	.02½
Marsh Mines	N. Y. Curb	*19	*15	*16		
Rex Con	N. Y. Curb	*8⅛	*8	*8⅛		
Simon S. L.	N. Y. Curb	....	....	*1⅛		
Stand. S. L.	N. Y. Curb	1/16	1/16	1/16	Oct. '17,	.05
Wilbert	N. Y. Curb	7⅛	6 1/16	7 1/16	Nov. '17,	.10
NICKEL-COPPER						
Internat'l Nickel	N. Y.	21⅛	20⅛	21	Mar. '19,	.50
Internat'l Nick. pf.	N. Y.	85	83½	85	Feb. '20,	1.50
QUICKSILVER						
New Idria	Boston	6	5⅛	5⅛	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	*15	*8	†*8		
VANADIUM						
Vanadium Corpn.	N. Y.	48⅞	46½	48		
GOLD AND PLATINUM						
So. Am. G. & P.	N. Y. Curb	....	....	8⅛		
MINING, SMELTING AND REFINING						
A. S. & R.	N. Y.	62⅞	59⅛	62⅞	Dec. '19,	1.00
A. S. & R., pf.	N. Y.	95⅛	94⅛	95	Mar. '20,	1.75
Am. Sm. pf., A	N. Y.	81⅛	81⅛	81⅛	Jan. '20,	1.50
Natl. Lead	N. Y.	78⅛	75⅛	78⅛	Dec. '19,	1.25½
Natl. Lead, pf.	N. Y.	108	105	108	Dec. '19,	1.75
U. S. Sm. R. & M.	N. Y.	67	64½	66	Jan. '20,	1.50
U. S. Sm. R. & M., pf.	N. Y.	45½	45	45	Jan. '20,	.87½

METAL STATISTICS

Monthly Average Prices of Metals

Silver

	New York			London		
	1918	1919	1920	1918	1919	1920
January	88.702	101.125	132.827	44.356	48.438	79.846
February	85.716	101.125	131.295	42.792	48.027	85.005
March	88.082	101.125	.....	43.620	48.171	.....
April	95.346	101.125	.....	47.215	48.886	.....
May	99.505	107.135	.....	48.980	52.104	.....
June	99.500	110.430	.....	48.875	53.896	.....
July	99.625	106.394	.....	48.813	54.133	.....
August	100.292	111.370	.....	49.077	58.835	.....
September	101.125	114.540	.....	49.500	61.668	.....
October	101.125	119.192	.....	49.500	64.049	.....
November	101.125	127.924	.....	48.969	70.065	.....
December	101.125	131.976	.....	48.492	76.432	.....
Year	96.772	111.122	.....	47.516	57.059	.....

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York Electrolytic		London Standard		London (b) Electrolytic	
	1919	1920	1919	1920	1919	1920
January	(a)	18.918	92.238	118.095	106.619	123.238
February	16.763	18.569	78.700	120.188	95.700	126.950
March	14.856	.....	76.821	.....	82.071	.....
April	15.246	.....	77.300	.....	82.200	.....
May	15.864	.....	77.767	.....	81.227	.....
June	17.610	.....	83.062	.....	85.900	.....
July	21.604	.....	99.576	.....	103.046	.....
August	22.319	.....	97.300	.....	106.429	.....
September	21.755	.....	100.767	.....	.....	.....
October	21.534	.....	103.418	.....	.....	.....
November	19.758	.....	98.894	.....	.....	.....
December	18.295	.....	103.708	.....	.....	.....
Year	18.691	.....	90.796	.....	.....	.....

(a) No market. (b) See note on page 490.

Lead

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	5.432	8.561	5.316	8.300	37.227	47.095
February	5.057	8.814	4.784	8.601	28.675	50.256
March	5.226	.....	4.992	.....	27.952	.....
April	4.982	.....	4.722	.....	24.888	.....
May	5.018	.....	4.773	.....	23.852	.....
June	5.340	.....	5.070	.....	22.544	.....
July	5.626	.....	5.408	.....	23.457	.....
August	5.798	.....	5.583	.....	25.330	.....
September	6.108	.....	5.853	.....	28.473	.....
October	6.487	.....	6.249	.....	34.731	.....
November	6.808	.....	6.649	.....	41.202	.....
December	7.231	.....	6.955	.....	.....	.....
Year	5.759	.....	5.530	.....	28.590	.....

Tin

	New York 99 Per cent		New York Straits		London	
	1919	1920	1919	1920	1919	1920
January	67.702	.....	61.596	.....	248.557	376.512
February	66.801	.....	58.466	59.932	223.963	395.750
March	67.934	.....	.....	.....	236.843	.....
April	72.500	.....	.....	.....	225.275	.....
May	72.500	.....	.....	.....	234.398	.....
June	71.240	.....	.....	.....	238.263	.....
July	68.000	.....	.....	.....	253.272	.....
August	57.226	.....	.....	.....	273.625	.....
September	54.482	.....	.....	.....	280.102	.....
October	54.377	.....	.....	.....	279.239	.....
November	53.307	.....	.....	.....	283.556	.....
December	53.870	.....	.....	.....	314.113	.....
Av. year	63.328	.....	.....	.....	257.601	.....

Zinc

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	7.272	9.483	6.922	9.133	56.045	58.643
February	6.623	9.058	6.273	8.708	46.150	61.338
March	6.500	.....	6.150	.....	38.500	.....
April	6.465	.....	6.114	.....	36.118	.....
May	6.429	.....	6.079	.....	35.477	.....
June	6.901	.....	6.551	.....	36.763	.....
July	7.873	.....	7.523	.....	41.815	.....
August	7.789	.....	7.160	.....	39.338	.....
September	7.510	.....	7.473	.....	40.955	.....
October	7.823	.....	7.827	.....	43.630	.....
November	8.177	.....	8.350	.....	46.588	.....
December	8.700	.....	8.350	.....	53.101	.....
Year	7.338	.....	6.988	.....	42.879	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer ‡		Basic ‡		No. 2 Foundry	
	1919	1920	1919	1920	1919	1920
January	$33.60	$40.47	$31.40	$39.88	$32.40	$39.86
February	33.60	42.954	31.40	42.61	32.40	43.40
March	32.54	.....	31.40	.....	29.12	.....
April	29.35	.....	27.15	.....	28.15	.....
May	29.35	.....	27.15	.....	28.15	.....
June	29.35	.....	27.15	.....	28.15	.....
July	29.35	.....	27.15	.....	28.15	.....
August	29.35	.....	27.15	.....	28.15	.....
September	29.35	.....	27.15	.....	28.15	.....
October	29.35	.....	27.15	.....	28.30	.....
November	31.60	.....	31.56	.....	32.16	.....
December	36.57	.....	35.32	.....	36.86	.....
Year	$31.11	.....	$29.26	.....	$28.35	.....

‡ As reported by W. P. Snyder & Co.

Monthly Copper Production in 1919

The table which appears herewith represents the crude-copper content of blister copper, in pounds.

MONTHLY CRUDE COPPER PRODUCTION, 1919

	September	October	November	December
Alaska Shipments	6,208,840	4,210,274	6,067,735	6,032,677
Arizona:				
Arizona Copper	2,900,000	2,900,000	2,900,000	2,900,000
Calumet & Arizona	4,494,000	5,998,000	6,320,000	5,778,000
Cons. Ariz. Smelting	600,000	625,000	670,000	615,000
Inspiration	5,800,000	7,000,000	7,000,000	7,000,000
Magma	770,937	634,511	579,000	719,800
Miami	4,139,103	4,877,395	3,718,965	4,519,910
New Cornelia	3,092,000	2,604,000	2,896,000	2,640,000
Old Dominion	2,460,000	2,365,000	2,261,400	2,534,000
Phelps Dodge	6,402,000	5,873,000	6,453,000	5,061,000
Ray	3,850,000	3,900,000	3,832,000	3,860,000
Shattuck Arizona	70,412	157,386	238,969	260,284
United Verde	4,990,000	5,000,000	5,100,000	5,450,000
United Verde Extension	3,247,216	3,760,892	2,288,414	3,740,024
Michigan:				
Calumet & Hecla	8,505,991	9,715,740	9,498,756	8,931,567
Other Lake Superior	6,490,000	6,421,000	6,420,000	6,420,000
Montana:				
Anaconda	12,780,000	15,000,000	14,120,000	3,300,000
East Butte	2,093,780	2,027,340	1,902,580	1,844,540
Nevada:				
Nevada Cons	4,250,000	4,200,000	3,525,000	4,500,000
New Mexico:				
Chino	3,538,704	3,287,905	3,749,434	3,388,524
Utah:				
Utah Copper	8,220,092	9,525,700	9,482,451	9,005,591
Eastern Smelters	1,400,000	1,400,000	1,500,000	1,500,000
Total reported	96,303,075	101,483,143	100,522,704	90,000,917
Others, estimated	12,400,000	13,660,000	17,005,000	13,257,000
Total United States	108,703,075	115,143,143	117,528,704	103,257,917
Imports: Ore and concentrates, etc	12,948,092	10,469,111	14,049,903	7,135,731
Imports in blister, etc	22,686,470	17,392,398	21,079,182	21,453,007
Grand Total	144,337,637	143,004,652	152,657,789	131,846,655
British Columbia:				
Granby Cons	1,584,515	2,164,344	1,776,863	1,544,446
Mexico:				
Boleo	1,477,280	1,708,560	1,146,880	933,097
Cananea	4,200,000	4,000,000	3,900,000	3,600,000
Phelps Dodge Mexican Properties	2,827,000	3,053,000	2,331,000	2,397,000
Other foreign:				
Cerro de Pasco	5,266,000	5,652,000	4,752,000	4,644,000
Chile	7,044,000	6,900,000	10,000,000	6,016,000
Katanga	4,440,064	4,916,258	5,511,500	473,989
Backus & Johnston	1,280,000	1,360,000	1,712,000	.....

Production of the United States by months since the beginning of the year and the corresponding figures for 1918 and 1919 were as follows:

	1918	1919
January	165,431,568	135,733,511
February	160,011,364	111,649,512
March	185,529,168	102,040,460
April	163,207,096	98,808,998
May	181,070,350	92,652,975
June	166,723,599	95,856,570
July	159,329,031	100,369,247
August	165,550,799	107,994,040
September	157,992,487	108,703,075
October	168,638,775	115,143,143
November	159,217,588	117,528,704
December	161,801,916	103,257,917